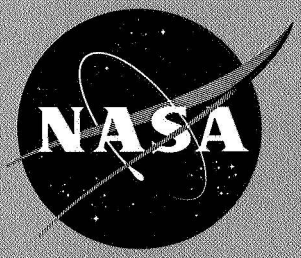
NASA SP-7500 (03)






# MANAGEMENT

## A CONTINUING LITERATURE SURVEY

– With Indexes –



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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NASA SP-7500 (03)

# MANAGEMENT

## A CONTINUING LITERATURE SURVEY

– With Indexes –

**A selection of annotated references to unclassified reports and journal articles entering the NASA Information System in 1968**

*Scientific and Technical Information Division*
OFFICE OF TECHNOLOGY UTILIZATION
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JUNE 1969
*Washington, D. C.*

# Introduction

*Management* is a compilation of references to unclassified reports and periodical articles on the subject of management that may be found in the NASA scientific and technical information system. The publication assembles groups of citations formerly announced in separate journals, *Scientific and Technical Aerospace Reports (STAR)* and *International Aerospace Abstracts (IAA)*, together with other reports included in the system but not previously announced.

The first issue (NASA SP-7500) covered material generated or sponsored by NASA during the period 1962 through 1967. The second issue (NASA SP-7500 (02)) covered the same period, but referenced material generated or sponsored by agencies other than NASA. The present issue covers references to material from both NASA and non-NASA sources that entered the system in 1968.

For greater convenience the selected items are grouped in nine categories as indicated on page vi. The categories bear no relationship to those in *STAR* and *IAA* but have been specially chosen for this publication. Three indexes are provided—subject, personal author, and corporate source.

Items concerning management in the fields of reliability and quality assurance have for the most part been excluded. Such items appear in *Reliability Abstracts and Technical Reviews (RATR)*, a monthly journal prepared by the NASA Scientific and Technical Information Facility from input provided for the National Aeronautics and Space Administration by the Research Triangle Institute, Durham, North Carolina.

Many of the abstracts included in *Management* have been reproduced from those appearing in *STAR* and *IAA*. This procedure, adopted in the interests of economy, has introduced some variation in size, style, and intensity of type.

# AVAILABILITY OF DOCUMENTS

## *STAR* ENTRIES

NASA documents are identified by an asterisk in the abstract section of the survey. NASA documents that have been microfiched[1] (identified by the # sign in the citation) are available on microfiche without charge to the following:

1. NASA Offices, Centers, contractors, subcontractors, grantees, and consultants;
2. Other U. S. Government agencies and their contractors;
3. Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public use;
4. Other organizations in the United States having a need for NASA documents in work related to the aerospace program; and
5. Foreign government or academic organizations that have established appropriate reciprocal arrangements with NASA.

Non-NASA documents are those documents that do not carry an asterisk in the citation. Department of Defense documents (identified by the "AD" number in the citation and indexes) are available, subject to a service charge, in hard copy or microfiche from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151. Microfiche copy of DoD reports will continue to be available to Defense Documentation Center users at no cost from the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314.

Other documents announced in the survey are available to the public as indicated in the citation.

## *IAA* ENTRIES

All cited documents are available from the AIAA Technical Information Service as follows:

Paper copies are available at $3.00 per document up to a maximum of 20 pages. The charge for each additional page is $0.25. Microfiche are available at the rate of $0.50 per microfiche for documents identified by the symbol # following the accession number.

A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library.

Minimum air-mail postage to foreign countries is $1.00.

Please refer to the accession number, e.g., A68-12345, when requesting documents. Address all inquiries and requests to:

Technical Information Service
American Institute of Aeronautics and Astronautics, Inc.
750 Third Avenue
New York, N. Y. 10017

[1] A microfiche is a transparent sheet of film, 105×148 mm in size, capable of containing up to 72 pages of information reduced to micro images (not to exceed 20:1 reduction).

# SUBJECT CATEGORIES

*Abstracts in the survey are grouped under the following categories:*

**M1 PROGRAM MANAGEMENT**

Includes project management; production management; systems management; logistics management; engineering management; management planning; resource and manpower allocation; program budgeting; operations research; decision making.

**M2 CONTRACT MANAGEMENT**

Includes contract incentives; contract decision making; procurement; subcontracts.

**M3 RESEARCH & DEVELOPMENT**

Includes research environment; R & D planning; R & D management; inventions and patents; research evaluation.

**M4 MANAGEMENT TOOLS & TECHNIQUES**

Includes program evaluation and review techniques (PERT); planning, programming and budgeting systems (PPBS); prediction analysis techniques (PAT); planned interdependency incentive method (PIIM); program trend line analysis; cost effectiveness; simulation; computers.

**M5 PERSONNEL MANAGEMENT**

Includes personnel problems; motivation; environmental problems; personnel development and training; recruitment; psychological studies; communication.

**M6 URBAN MANAGEMENT**

Includes application of space technology and management techniques to urban problems; federal resources and urban needs; public administration; transportation planning.

**M7 MANAGEMENT POLICY & PHILOSOPHY**

Includes management concepts; policy studies; organizational studies and problems; social relationships and problems.

**M8 ECONOMICS**

Includes impact of federal expenditures and programs; government/industry relations; federal financing; federal budgeting.

**M9 GENERAL**

Includes conference proceedings; reviews; patent information; speeches; bibliographies.

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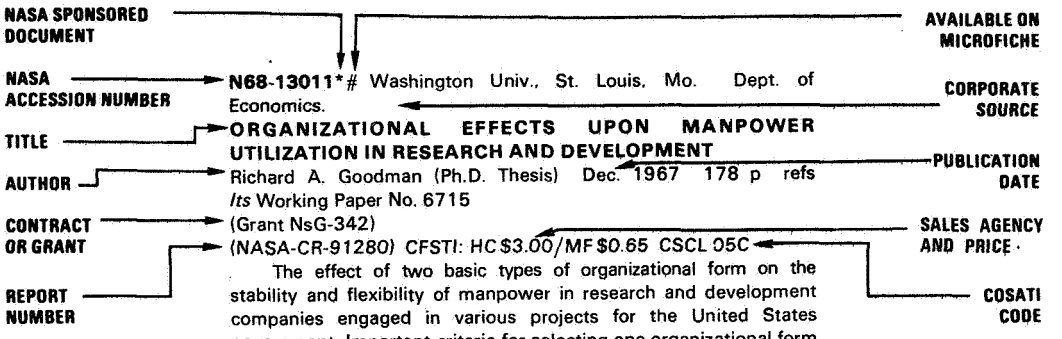
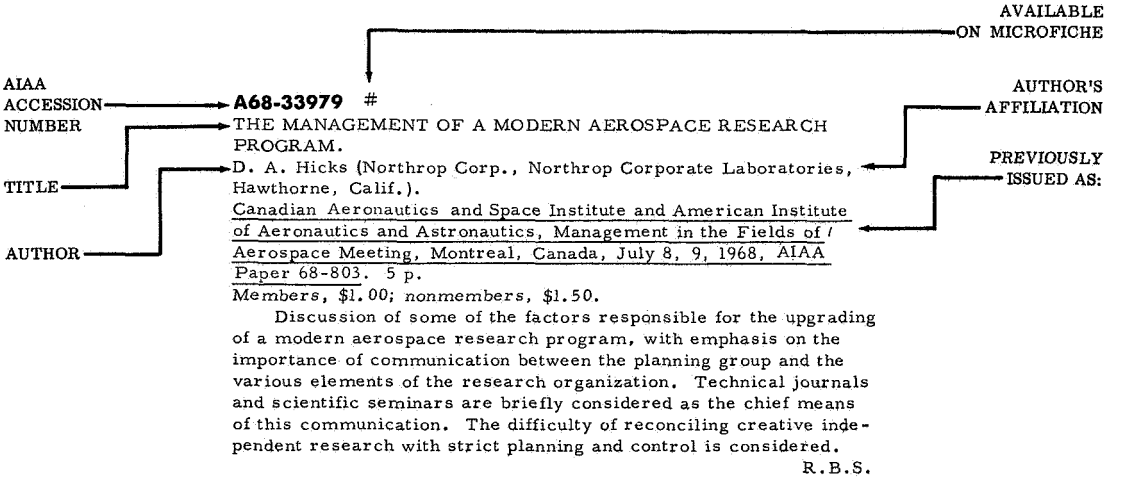
## TYPICAL CITATION AND ABSTRACT FROM *STAR*




## TYPICAL CITATION AND ABSTRACT FROM *IAA*



# MANAGEMENT

*a continuing literature survey*

JUNE 1969


## STAR ENTRIES

### M1 PROGRAM MANAGEMENT

**N68-88319*** California Univ., Los Angeles. Graduate School of Business Administration.
**INDUSTRIAL PROJECT MANAGEMENT**
George A. Steiner and William G. Ryan Oct. 1966 150 p refs
(Grant NsG-237)
(NASA-CR-83193; RP-17) CFSTI: $3.00

The results of a study on managerial practices and problems in the aerospace industry are presented. Important types of project management are described and analyzed. Major philosophies, principles, and practices employed by the project managers studied are discussed. Some major past and current trends, resulting in a general tightening of government supervision and a consequent lessening of the project managers' authority, are examined. Discussions at a conference held on the validity of the managerial model and on problems faced by industrial project managers are summarized, including observations of project managers on loose-rein, mutual trust, and desirable personal traits, and on project management authority as it relates to project success and incentive contracting. The future of loose-rein project management is also treated. P.A.B.

**N68-87740*** Brown Engineering Co., Inc., Huntsville, Ala.
**ADVANCED PLANNING METHODOLOGY: A BASIC PERSPECTIVE AND PLAN**
H. L. Turner, Jr. 23 Jul. 1965 144 p refs
(Contract NAS8-20073)
(NASA-CR-61145) CFSTI: $3.00

The process of long range or advanced planning and methods, is defined, while taking into consideration the myriad planning influences. A behavior model is developed which purposes to show the resources-capability-behavior characteristics and sorting bins for these characteristics. Objectives are presented down an organizational path from the executive level of the country to the specific activities of the George C. Marshall Space Flight Center of the National Aeronautics and Space Administration. The illustrative nature of this projection is emphasized heavily. A people-methodology-information-system approach to simulating and tracking the resources-capability-behavior characteristics of our particular area of the world is presented. Information pickoffs relative to world phenomena, if implemented in proper fashion, are allowed. These plans are synthesized and developed; the implementation of them is simulated; cost effectiveness is determined; and some gaming associated with the plans is examined. The outcome of this process then allows recycling and iteration on technical strategy-cost-effectiveness optimums. Author

**N68-87506#** Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
**PLANNING, SCHEDULING, AND CONTROLLING AN ENGINEERING DESIGN GROUP**
E. E. Choat 27 May 1968 105 p refs
(Contract W-7405-eng-26)
(Y-1621) CFSTI: HC$3.00/MF$0.65

The development of an improved planning, scheduling, and control system for use in an engineering design section is described and evaluated with respect to changes in productivity. The system includes a procedure for investigating new job assignments, the critical path method technique to plan all jobs, a computerized scheduling program, and a control system built into a routine review procedure. Production records were analyzed to determine the productivity of the section for a period encompassing one year prior to the changes and four years after the changes. These data indicate that there was a significant decrease in the number of manhours spent per drawing produced, following the initiation of the newly developed system. It is concluded that the changes made in the planning, scheduling, and control system have contributed significantly to this increase in productivity. Those elements that are viewed as having been improved and which might be expected to produce an increase in efficiency are: planning, scheduling, control, coordination, communications, job investigation, and job knowledge. Author (NSA)

**N68-87207#** Army Materiel Command, Washington, D. C.
**MANAGEMENT AND THE SYSTEMS ANALYSIS MYSTIQUE**
Paul L. Peck, Jr. 1968 33 p ref
(AD-669751) CFSTI: HC$3.00/MF$0.65

It has become evident to most managers that a capability in systems analysis is a prerequisite of success. Not only is systems analysis useful in decision making and problem solving, but it has become the leading buzzword of the day. This can be seen by the fame or notoriety of the DOD systems analysis group developed by Robert McNamara, the fact that the management science groups of most universities stress systems analysis in their brochures, and the salary wars being waged to hire systems analysts. This paper is designed to penetrate the mystique which surrounds systems analysis. In addition to defining systems analysis, the advantages and limitations of this technique are discussed, a

general purpose methodology is developed, and a description of one application of the methodology is provided. Author (TAB)

**N68-85785** National Bureau of Standards, Washington, D. C. Technical Analysis Div.
**OPERATIONS RESEARCH**
J. A. Joseph, ed. Dec. 1967 33 p refs Proceedings of Conf. for Washington Area Govt. Agencies, Washington, 22 Apr. 1966 *Its* Misc. Publ. 294
GPO: $0.25

Opportunities for the future of operations research (OR) in the civilian sector of the government are discussed. The combination of planning, programming, and budgeting into an integrated system for federal agencies is described, with information on program structures, multi-year programs and financial plans, program memoranda, and the role of the analyst. Operations research research, defined as research into OR techniques and tactics, is considered, with particular emphasis on government studies. The discussion includes demand and supply; data, dissemination, and documentation; communication, organization, and strategy; and mathematical methods and models. Panel discussions are summarized, concerning special OR problems in civil agencies of the government and methods of broadening the OR competence of mid-careerists. P.A.B.

**N68-85346** System Development Corp., Santa Monica, Calif.
**COMPUTING FACILITY MANAGEMENT SURVEY, RESULT AND ANALYSIS**
Charles W. Lawson 19 Mar. 1962 61 p
(AD-665480; TM-704) CFSTI: HC $3.00/MF $0.65

This summary report is the result of a survey on computing facility management. The purpose of the project was to gather and synthesize data which would help to define opinions, trends, and methods of management decision-makers in the computerized data processing fraternity. A comprehensive series of questions were initially devised relating to 'general areas' of concern to management. Participation in the survey by specific companies within the Southern California area was expressly invited; thirty diversified computing facilities volunteered cooperation.
Author (TAB)

**N68-84549** Stanford Univ., Calif.
**OPTIMUM PLANT SIZE AND LOCATION UNDER UNCERTAINTY**
James McKanna Gregory (Ph.D. Thesis) 1967 142 p
Available from Univ. Microfilms: HC $6.80/MF $3.00 Order No. 67-7917

The planning problem of determining optimum plant size and location is considered. The term plant is used to mean the total facilities available at one geographic location for production or service. A plant is defined to be optimum if the total expected costs of installation and operation are minimum. Operating cost includes production, transportation, and import (or penalty) charges that are incurred when demand exceeds plant capacity. Demand is considered to be the only source of uncertainty in this problem and is treated as a random variable of known probability distribution. A series of single period mathematical models is formulated and solved using both analytical and numerical methods. In each case the emphasis is on investigating the behavior of optimum plant size, location, and total expected costs as the ratio of demand standard deviation to demand mean is varied. Dissert. Abstr.

**N68-83728#** Office of Aerospace Research, Washington, D. C.
**LONG-RANGE FORECASTING AND PLANNING**
Joseph P. Martino et al 1966 205 p refs Symp. held at Colorado Springs, 16–17 Aug. 1966
(AD-664108) CFSTI: HC $3.00/MF $0.65

The report is the proceedings of a Long Range Forecasting and Planning Symposium held at the Air Force Academy on 17–18 August 1966. The symposium was cosponsored by the Air Force Office of Scientific Research, the Office of Research Analyses, and the Frank J. Seiler Laboratory, all of the Office of Aerospace Research. It contains the papers which were presented at the symposium, and the discussion of these papers. The papers dealt with various aspects of making and using long range forecasts and plans.
Author (TAB)

**N68-83275*** New York Univ., N. Y.
**GRADUATE SCHOOL OF PUBLIC ADMINISTRATION. ADMINISTRATION BY CONTRACT: THE THINK TANKS**
Peter L. Shaw (M.P.A. Thesis) Feb. 1968 199 p refs
(Grant NGR-33-016-067)
(NASA-CR-93258) CFSTI: $3.00

An evaluation is presented on the relationship between the Federal agencies and the organizations whose sole purpose is to sell research and development capabilities to the Federal Government. Dubbed the think tanks, these organizations have became an integral part of the Federal decision-making process on a contractual basis. The Federal R & D effort is described in terms of governmental reliance upon this extramural performer group, and definitional problems in forming a typology of think tanks are assessed. A comprehensive typology is suggested with examples of each type cited. Some characteristics of government—think tank relationships are identified by focusing on the activities of the Department of Housing and Urban Development. M.G.J.

**N68-82802** RAND Corp., Santa Monica, Calif.
**MANPOWER ALLOCATION AND MATHEMATICAL PROGRAMMING**
Eugene P. Durbin Mar. 1967 16 p refs Presented to Manpower Allocation Panel of the 19th Mil. Operations Res. Symp., Ft. Bliss, Tex., 25 Apr. 1967
(P-3553) Available Issuing Activity

The values accruing to the decision-maker from formulating and analyzing a manpower allocation problem as a mathematical programming problem are enumerated, and the problems involved in such a solution technique are examined. The rotation base requirement problem of the Air Force is given as an example to show how an accurate estimating tool can be constructed. The primary tasks involved in the modeling programming efforts are delineated. Also included are some generalizations of the rotation situation which lead to familiar and pervasive manpower and personnel assignment problems. An indication is given of how these problems may be formulated in a mathematical programming context, the type of information available, and the analyses which can be performed. M.G.J.

**N68-37665** Michigan State Univ., East Lansing.
**A STUDY OF THE ROLE OF THE ENGINEERING MANAGER AND HIS CONTINUING EDUCATION REQUIREMENTS**
Charles Alan McKee (Ph.D. Thesis) 1967 288 p
Available from Univ. Microfilms: HC $13.05/Microfilm $3.70 Order No. 68-4187

The main purpose was to investigate the relationships among the perceptions engineering managers have of their role, their continuing education activities, and subject area needs, and among the expectations held for them by their immediate superiors, direct subordinates, and by engineering faculty outside of the organization. Role theory was adopted as the conceptual approach to study the

position of the engineering manager. As a general conclusion of the entire study: (1) The engineering managers showed the highest degree of consensus of the four individual groups. (2) The engineering managers and the immediate superiors showed the highest degree of consensus of the compared groups. (3) The engineering managers and the immediate superiors showed the lowest number of significant differences of the compared groups. Dissert. Abstr.

**N68-36920#** European Space Technology Center, Noordwijk (Netherlands).
**SYSTEM MANAGEMENT: OPTIMIZATION OF A SATELLITE PROJECT**
J. Schatz Paris ESRO Apr. 1968 20 p refs
(ESRO-TM-132(ESTEC)) CFSTI: HC $3.00/MF $0.65

The economics of a project can be improved by incorporating a project optimization group in the organization of the project program. Such a group should consist of specialists in the technical, financial, planning and organizational fields. It assesses the progress made on the project between the management and the specialist teams, evaluates any anomalies in the program, submits proposals for optimization to the project management and, if they are rejected, refers them to the executive management. Author (ESRO)

**N68-35785#** Joint Publications Research Service, Washington, D. C.
**CONTROL IN LARGE SYSTEMS**
A. Ya. Lerner 30 Sep. 1968 26 p Transl. into ENGLISH from the Book "Tekhnicheskaya Kibernetika v SSSR" Moscow, Nauka Press, 1968 p 200-221
(JPRS-46561) CFSTI: HC $3.00/MF $0.65

Principles of mathematical modeling of large systems are discussed, along with the inherent difficulties caused by the high dimensionality, structural complexity, multiplicity of nonlinear relations between variables, probabilistic nature of parameter changes, and solely stochastic relationships among the variables of large systems. Attention is given to the analysis and synthesis of system structures, control of operations, and the distribution of resources such as materials, personnel, and money. Control of production complexes and various aspects of control theory are considered. M.W.R.

**N68-31996#** Naval Supply Depot, Mechanicsburg, Pa. Operations Analysis Dept.
**VARIABLE OPERATING AND SAFETY LEVEL (VOSL) ANALYZER OPERATING MANUAL**
Philip Kohlhass May 1968 75 p
(ALRAND-59; AD-670750)

Intuition based on experience has for many years been the main guideline for the manager in establishing policy. Currently, the inventory manager operates a complex system containing a number of interacting variables which must be properly adjusted to reflect his policies and yet remain within the constraints placed by higher authority. Mistaken judgments become evident after the fact unless the manager has some means of analyzing his policies as applied to his inventory. This manual describes a computer analyzer designed to provide him with pertinent statistics for comparing alternative management policies. It provides insight with less risk. Author (TAB)

**N68-31342#** European Space Technology Center, Noordwijk (Netherlands).
**PROJECT MANAGEMENT: A PROPOSAL TO INCREASE THE EFFECTIVENESS OF PROJECT GROUPS**
J. Schatz Paris, ESRO Mar. 1968 20 p refs
(ESRO-TM-115) CFSTI: HC $3.00/MF $0.65

On the basis of experience acquired in the development of an international satellite project, a proposal is made for the efficient organisation of project management; this proposal is applicable to both future and current programs. The essential characteristic of the proposed scheme of organization is the delegation of responsibility (together with the corresponding authority) by the system manager to the subsystem management and, in turn, to system engineer level. Author (ESRO)

**N68-25125** Arizona State Univ., Tempe.
**THE DEVELOPMENT OF A COMPLETE MULTI-PROJECT SCHEDULING SYSTEM USING A FORECASTING AND SEQUENCING TECHNIQUE**
Larry Glenn Fendley (Ph.D. Thesis) 1967 289 p
Available from Univ. Microfilms: HC $13.05/MF $3.75 Order No. 67-3199

A total-system approach was taken to the multi-project scheduling problem. Rather than treat the problem as one of determining the best priority rule or the best progress-reporting system or the best expediting system, the problem was treated by designing a scheduling system which accommodates projects from order date to finish date. Incoming projects were considered to be PERT-type projects entering an organization with limited resources with which to perform each project by a set due date. The digital simulation technique was used to test eight priority rules and to provide data for use in finding a method for setting due dates. It was found that the minimum-slack-first priority rule, when coupled with a forecasting technique for setting due dates, performed well in meeting those due dates. Dissert. Abstr.

**N68-24494#** General Electric Co., Philadelphia, Pa. Missile and Space Div.
**A FUNCTIONAL BASIS FOR PLANNING ADVANCED TECHNOLOGIES**
M. L. Cutler Jun. 1967 35 p refs
(Rept.-67SD257)

Progress in basic functions, such as transportation, communication, computation, and the like can be measured, graphically displayed and used as a guide for projecting future progress. When the units of measure selected are both technologically significant and indicative of progress, growth proceeds in a series of cycles, bounded on the upper side by a primary growth trend of the form $ae^{bt}$. This outer envelope represents the latest state-of-the-art, and can be used to uncover technological and timing problem areas for planning advanced technologies. Case histories, methodology, pitfalls and uses for management planning are provided. Sample forecasts of the future capability to perform selected functions are also provided. Author

**N68-20885#** RAND Corp., Santa Monica, Calif.
**DESIGN CONSIDERATIONS FOR A COMPUTER-ASSISTED MAINTENANCE PLANNING AND CONTROL SYSTEM**
S. M. Drezner and R. L. van Horn Feb. 1968 61 p refs
(P-3765; AD-665451)

The paper describes the design considerations for a Computer-Assisted Maintenance Planning and Control System, called CAMCOS, to support an Air Force base-level maintenance organization in the planning and control of its activities. TAB

**N68-13399#** System Development Corp., Santa Monica, Calif.
**THE ENVIRONMENT OF COMPUTER OPERATING SYSTEM SCHEDULING: TOWARD AN UNDERSTANDING**
Einar A. Stefferud 7 Nov. 1967 15 p
(SP-2995; AD-661666)

Scheduling and allocation of computing facilities is generally carried out in a very primitive and ineffective way. The difficulty

stems from a number of sources including: (1) semantic confusion, (2) failure to consider all relevant factors, (3) failure to establish a global context for analysis of specific operational problems. This paper attempts to establish the required context by considering all relevant factors and by carefully sorting out the semantics. Specifically, market principles are employed to characterize the environment at its most general level. At the detailed level, a model based on the dimensions of (1) demand magnitude, (2) interaction rate, and (3) deadline penalty severity is presented. Author (TAB)

# M2 CONTRACT MANAGEMENT

**N68-88316*** California Univ., Los Angeles. Graduate School of Business Administration.

**THE PRE-SOLICITATION PHASE ON GOVERNMENT R AND D CONTRACTING**

Gaylord E. Nichols, Jr. 15 Apr. 1966 30 p refs
(Grant NsG-237)
(NASA-CR-83194; RP-10) CFSTI: $3.00

The effects of early feasibility and design studies on the eventual outcome of research and development projects are investigated. Studies were made of two aerospace companies and a space research and development center to ascertain the conditions and environment under which early advanced study activities are undertaken, including evaluation of alternate approaches to project implementation in terms of technical feasibility, cost effectiveness, reliability, and timeliness. It is concluded that important competitive factors operate prior to the formal initiation of the procurement process which, in addition to affecting project planning and initiation, also heavily influence the eventual selection of a specific contractor. This early activity is considered sufficiently important to be termed a distinct phase of the procurement cycle. This pre-solicitation phase is examined as to sponsoring agency and contractor roles, the decision environment, project initiation, and the contractor selection process. P.A.B.

**N68-87770** Congress. House. Committee on Government Operations.

**CRITERIA FOR SUPPORT SERVICE COST COMPARISONS**

Washington GOP 1968 33 p Hearings before Comm. on Govt. Operations, 90th Congr., 2d Sess. *Its* House Rept. no. 1850
Available Issuing Activity

A study was conducted to see if cost factors could be established that would enable federal agencies to determine efficiently and quickly whether needed support services should be secured through contracts or civil service personnel usage. The findings of the investigating committee are given and discussed. It was recommended that the Bureau of the Budget should issue a circular to provide specific criteria for making cost comparisons for support services. A requirement that cost comparisons should be made prior to contract letting, specification of the range of cost differential between government and contract operations, and the criteria for applying this range to support service determinations, should be included in the circular. Suggestions for excluding common costs from incremental cost comparisons, making simplified cost comparisons, applying cost factors to civil service fringe benefits, and evaluating the rigid application of Civil Service Commission personnel ceilings and rulings relating to support services are also discussed. P.A.B.

**N68-86793*** Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.

**MARKETING AND ENGINEERING STRATEGIES FOR WINNING R AND D CONTRACTS**

Edward B. Roberts Jul. 1965 31 p refs Presented at the 4th Ann. Management Conf. on Marketing in the Defense Ind., Boston, 27 May 1965; Sponsored jointly by Am. Marketing Assoc. and Boston Coll. Announced previously as X66-36308
(Grant NsG-235)
(NASA-CR-74553; Rept. 128-65) CFSTI: $3.00

It is proposed that, rather than the award of research and development contracts being primarily a case of company proposal preparation followed by government proposal evaluation, the award is more often a case of person to person contact, technical information exchange, and development of confidence and trust. Both government and industry data are examined to demonstrate the essentiality of the informal personal aspects of the R & D marketing situation. Suggestions for taking this factor into account are made for the areas of bid-no bid decision making and engineering budgeting. P.A.B.

**N68-84125** George Washington Univ., Washington, D. C.

**MATHEMATICAL MODELS FOR MULTIPLE INCENTIVE CONTRACTING**

John Earl Condon (Ph.D. Thesis) 1967 163 p
Available from Univ. Microfilms: HC $7.60/MF $3.00 Order No. 67-7400

A mathematical model is developed and described to serve as a basis for incentive contracts between buyer and seller. The model defines incentive fee as a joint function of the cost, performance, and delivery parameters using a separable mathematical formulation in which all interdependencies are described. Two parameter incentive models for any paired combination of the cost, performance, and delivery parameters are derived from the general three-parameter incentive model. Analytical methods are developed for use in the planning and structuring of the incentive model and for evaluating parameters in tradeoff decisions which influence the incentive fee. Approximation techniques, in the form of nomographs, are presented for quick evaluation of incentive model characteristics, these are particularly useful during buyer–seller negotiation of the final configuration of the incentive model. The input data necessary for structuring the incentive models are discussed and procedural guidelines presented for the determination thereof. Dissert. Abstr.

**N68-20298#** California Univ., Los Angeles. Western Management Science Inst.

**AN ANALYSIS OF CONTRACTUAL INCENTIVES**

Marvin Hienz Berhold (Ph.D. Thesis) Sep. 1967 191 p refs *Its* Working Paper No. 129
(Contract Nonr-233(75))
(AD-665276)

In the model two persons are considered, a principal and an agent. The principal wants to motivate the agent to make an appropriate decision because the results depend on the agents decision. The principal will motivate the appropriate decision by relating monetary payments to a characteristic of the agents performance. This relationship between the monetary reward and the characteristic of the agents performance is called the incentive function. Government contracts as used in the weapons acquisition process provide an example of contractual incentives. The government is the principal and the contractor is the agent. The model concerns itself with the contractors problem of selecting an optimal production method subsequent to the time when the contract is specified. In addition the method concerns itself with the governments problem of specifying a contract which will motivate the contractor to accept the contract and subsequently to choose a production method which will minimize the net cost of the contract. Government contracts are characterized by the sharing ratio which indicates the proportion of the cost reduction which the contractor will receive. The model shows that under certainty the optimal sharing ratio is 1. Author (TAB)

**N68-16336*#** San Diego State Coll., Calif.
**THE NASA SOURCE EVALUATION BOARD PROCESS: A DESCRIPTIVE ANALYSIS**
Richard H. Nolan (M.S. Thesis) Houston, Tex. NASA. Manned Spacecraft Center Dec. 1967 70 p refs Sponsored by NASA
(NASA-CR-65934; MSC-BM-MR-67-2) CFSTI: HC $3.00/MF $0.65 CSCL 05A

Numerous methodologies were employed in gathering the data necessary to reach conclusions about the Source Evaluation Board (SEB) process, including personal interviews held with officials at NASA headquarters. The printed data which were available and reasonably related to the SEB process were also consulted, and this material varied from books and articles to on-site reports of SEB operations. The author's observations resulted from an examination of the SEB review process as applied to two contract competitions at MSC. The data from this study indicate that the NASA/SEB process operates upon numerous and varied foundations. A number of benefits which accrue from SEB activities are not directly related to the goal of selecting the most competent contractor. For example, the SEB process is an effective measuring device used by the NASA Administrator to determine how well contractors are developing their capabilities and to gauge the quality of the thinking of top NASA officials. According to evidence obtained, the operational aspects of the process are basically sound. Author

**N68-14624*#** Oklahoma Univ., Norman. Dept. of Political Science.
**THE ROLE OF SMALL BUSINESS IN FEDERAL GOVERNMENT R&D CONTRACTING: THE MSC EXPERIENCE**
Carol S. Mollison (M.S. Thesis) Houston, Tex. NASA. Manned Spacecraft Center Dec. 1967 50 p refs Sponsored by NASA
(NASA-CR-65916; MSC-BM-MR-67-5) CFSTI: HC $3.00/MF $0.65 CSCL 05A

Success and failure experiences of the NASA Manned Spacecraft Center (MSC) in doing business with small business firms are discussed. The NASA MSC Small Business Program is described; and both the MSC and company viewpoints are presented. Research and development contract negotiations and awards are analyzed. Case study histories of business dealings are given. Recommendations for strengthening and making more effective the MSC Small Business Program are made. L.S.

**N68-10403*#** National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
**METHODS OF ANALYZING THE IMPACT OF PROGRAM STRETCHOUTS**
William Rudelius (Minnesota Univ.) Nov. 1967 38 p refs
(NASA-TM-X-60600; MSC-BA-MR-67-4) CFSTI: HC $3.00/MF $0.65 CSCL 05A

Delays in programs that involve the procurement of major aerospace systems are analyzed by using the elements of most of the methods observed in actual stretchout negotiations. This method involves summing the incremental costs that the stretchout contributes to each task or work package in the program. This detailed analysis often shows that some work packages are totally unaffected by the stretchout. It is recommended that NASA establish more explicit guidelines for fixing responsibility for stretchout cost additions; and that, in addition to an incremental cost analysis of tasks, NASA should develop contract clauses that permit postponement of scheduled deliveries under a predetermined cost arrangement and that reward a contractor for utilizing personnel that are temporarily surplus because of the stretched-out program. When the delivery date of one program influences subsequent delivery dates, NASA should use incentive alternatives other than the currently used reincentivizing approaches. M.W.R.

# M3 RESEARCH & DEVELOPMENT

**N68-87949** # American Univ., Washington, D. C. Center for Technology and Administration.
**THE FUNDAMENTAL RESEARCH ACTIVITY IN A TECHNOLOGY-DEPENDENT ORGANIZATION**
Howard M. Vollmer ed., Lawrence W. Bass, J. E. Goldman, Floyd Mann, Donald G. Marquis et al AFOSR 1965 111 p refs Selection of papers presented at the 10th Inst. on Res. Admin., Washington, D.C., 26–29 Apr. 1965; Sponsored by American Univ., Washington, D. C.
(AFOSR-65-2691) CFSTI: HC $3.00/MF $0.65

A selection of papers is presented on the role and organization of fundamental research activities within the context of larger technology-dependent organizations in private industry and in the federal government. Subjects include: the basic rationale for fundamental research in such contests; the characteristics of the scientists typically involved; the organization and management of research activities; work unit effectiveness in a scientific organization; the utilization of the extramural science-oriented community by the Air Force office of scientific research; and managerial principles for planning research for industry and government, with emphasis on newly developing countries. Data on the organizational separation of research from development are also examined. A selected bibliography is included. P.A.B.

**N68-84218** Arizona State Univ., Flagstaff.
**RESEARCH AND DEVELOPMENT PROJECT SELECTION: INTER-DEPENDENCE AND MULTI-PERIOD PROBABILISTIC BUDGET CONSTRAINTS**
Lawrence James Watters (Ph.D. Thesis) 1967 74 p
Available from Univ. Microfilms: HC $8.00/MF $3.00 Order No. 67-7365

The development of a decision model and solution technique is studied for application to investment selection problems, in which (1) cash flows are not known with certainty, (2) some or all of the investment opportunities are interrelated, (3) limited funds in multiple fiscal periods necessitate the imposition of multi-period probabilistic budget constraints, and (4) the suitability of undertaking a given portfolio of investment opportunities depends upon both profitability and risk considerations. The presentation is directed primarily at solving R & D project selection problems, although the results are sufficiently general to find applicability to a wide variety of investment situations. Dissert. Abstr.

**N68-82801** RAND Corp., Santa Monica, Calif.
**TECHNOLOGICAL PROJECTION AND ADVANCED PRODUCT PLANNING**
Frederick S. Pardee Jul. 1967 30 p refs Presented at 1st Ann. Technol. Management Conf., Lake Placid, N. Y., 22–25 May 1967
(P-3622) Available Issuing Activity

A series of refinements to the methodology of technological forecasting are offered. These suggestions are designed to increase the utility of information generated in such forecasts by communicating more fully both the major underlying assumptions and the sensitivity of the resulting projections. The steps involved in proceeding from technical feasibility to commercial profitability are discussed. Possibilities are explored for linking the techniques of technological projection with those of capital investment analysis and new product planning. Suggestions are also included on areas in which capital investment methodology needs extension and refinement. Author

**N68-82665** Harvard Univ., Boston, Mass.
**TECHNOLOGY, INFORMATION, AND ORGANIZATION: INFORMATION TRANSFER IN INDUSTRIAL R AND D**
Richard S. Rosenbloom and Francis W. Wolek (Pennsylvania Univ.) Jun. 1967 252 p refs
(Grant NSF GN-305)
(PB-175959) CFSTI: HC $3.00/MF $0.65

This is an empirical study of information transfer in the R and D operations of large industrial corporations. Its basis is a body of survey data collected from 2000 engineers and scientists in 13 establishments of four corporations and from 1200 members of the Institute of Electrical and Electronics Engineers. The data describe instances in which respondents acquired useful technical information from sources outside their immediate circle of colleagues. The analysis is descriptive in character, following a functional approach in which the use of various means of information transfer is considered in relation to the purposes of technical work. The report discusses the effects which management may have, within an organization, on the process of information transfer. Author (USGRDR)

**N68-81441#** Joint Publications Research Service, Washington, D. C.
**ANALYSIS OF INFORMATION FLOWS AS A MEANS OF FORECASTING LONG-RANGE SCIENTIFIC RESEARCH**
V. V. Kosolapov *In its* Analysis of Inform. Requirements and Process. for Sci. Res. 30 Oct 1967 p 1–13 refs (See N68-81440)
CFSTI: HC $3.00/MF $0.65

Consideration is given to the quantitative and useful characteristics of information flows and their connections with scientific investigations. The problem of the value of scientific information and the possibility of predicting long-range scientific research are discussed, and the probable trends of scientific development are assessed. Author

**N68-10773** Joint Publications Research Service, Washington, D. C.
**SCIENTIFIC-TECHNICAL DEVELOPMENT AND PRINCIPLES OF LONG-TERM PLANNING**
Ladislav Riha 16 Nov. 1967 17 p Transl. into ENGLISH from Nova Mysl. (Prague), no. 2, Feb. 1967 p 3–7
(JPRS-43352; TT-67-33976) CFSTI: $3.00

The development of long-term socio-economic and technical-economic studies is discussed in relation to the basic concept of satisfying the needs of society with maximum efficiency and application of the law of time economy. The overall resources and basic factors of economic growth are realistically evaluated, and the basic alternatives of the structural economic development of a given country are considered from the viewpoint of the trends of scientific–technical progress and expected changes in the world economy and in the national economy. A study outline is proposed to show the direction in which the forces and the attention of the society should be oriented, and the sequence in which they should be applied to accelerate to the maximum degree the rate of speed of the socio-economic development to meet the needs of the entire society and of each individual. M.G.J.

# M4 MANAGEMENT TOOLS & TECHNIQUES

**N68-88159*** California Univ., Berkeley.
**THE POLITICAL ECONOMY OF EFFICIENCY: COST-BENEFIT ANALYSIS, SYSTEMS ANALYSIS, AND PROGRAM BUDGETING**
Aaron Wildavsky [1966] 46 p refs Presented at the Conf. on the Study of Policy Content and its Relevance for the Study of Politics, Princeton, N. J., 15–17 Jun. 1966
(Grant NGR-05-003-125)
(NASA-CR-77103) CFSTI: $3.00

The three modes of achieving efficiency are discussed with relation to showing how much more is involved than mere economizing. The fact that it becomes difficult to maintain pure notions of efficiency, even at the most modest level of cost-benefit analysis, is shown. Systems analysis, at a higher level, is based on a mixed notion of efficiency; program budgeting, at the highest levels, overreaches into the political structure and appears to be a form of political systems analysis. Some of the conditions under which the modes might or might not be useful are specified. The three modes of analysis are described as techniques for decision making. It is proposed that their characteristic feature appears to be their use as aids to calculation, designed to circumvent the areas of uncertainty between quantitative analysis and judgement. P.A.B.

**N68-87577** RAND Corp., Santa Monica, Calif.
**THE ROLE OF COST-UTILITY ANALYSIS IN PROGRAM BUDGETING**
G. H. Fisher Sep. 1964 46 p refs
(RM-4279-RC) Available Issuing Activity

Cost-utility analysis is defined as a systematic examination and comparison of alternative courses of action which might be taken to achieve specified objectives for some future time period. All relevant alternatives which can be initially identified should be examined, and if necessary, additional ones designed. Identification of these alternatives and clarification of their implications aid in sharpening the judgement of the decision makers. The main characteristics of cost-utility analysis and some of the major considerations involved in carrying it out are discussed. Two illustrative examples are given, concerning application of the analysis to a military and to a nonmilitary problem. P.A.B.

**N68-86351#** Mitre Corp., Bedford, Mass.
**APPLICATION OF COST-EFFECTIVENESS ANALYSIS TO EDP SYSTEM SELECTION**
Jack D. Porter and Bernard H. Rudwick Mar. 1968 60 p refs
(Contract AF 19(628)-5165)
(AD-667522; MTR-527; ESD-TR-67-412) CFSTI: HC $3.00/MF $0.65

A conceptual approach for evaluating and selecting among alternative electronic data processing (EDP) systems proposed to meet a set of EDP user needs has been developed by applying cost-effectiveness methods and techniques to the source selection problem. The report provides a framework that allows the EDP system evaluator to combine the selected relevant system performance measures and the related cost elements to arrive at a rational dependable selection decision. Author (TAB)

**N68-86243#** Whittenburg, Vaughan Associates, Inc., Alexandria, Va.
**AN INFORMATION SYSTEM PLANNING GUIDE: PRELIMINARY DEVELOPMENT AND CHECKOUT**
John A. Whittenburg and Anne W. Schumacher Feb. 1968 262 p refs
(Contract NSF-C-
(W/V-RR-68/1-WD; PB-177601) CFSTI: HC $3.00/MF $0.65

One of the responsibilities of the National Science Foundation is to support the effective dissemination of scientific information. This responsibility necessitates making decisions which are similar to those demanded from systems managers. The desired end product of this study is the development, checkout, and refinement of a set of explicit guidelines for use by individuals who are assigned the role of information system managers. The objective was threefold: (1) to identify the variables, criteria, and system management features of concern and to classify and relate them, (2) to structure a preliminary version of an integrated system management guide, and (3) to pretest the system management tool by selecting and analyzing alternative information systems.

Author (USGRDR)

**N68-85322** Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.

**THE STRATEGIC DIMENSIONS OF COMPUTER SYSTEMS PLANNING**

Charles H. Kriebel Jan. 1968 27 p refs

(Contract Nonr-760(24))

(AD-665319; RR-117) CFSTI: HC$3.00/MF$0.65

The computer, formerly a determinant of the efficiency of internal corporate systems, is fast becoming a key to corporate effectiveness in the total business environment—a major factor influencing corporate performance viz-a-viz competition. To effectively capitalize on the true potential of corporate computer systems today, all levels of management must contribute and participate in their development. Too often the orphan of company computer system planning has been corporate top management, and the chief executive officer in particular. A fundamental requirement for the computer systems success is direction from the top. The form of this direction should be a company computer strategy: an explicit statement by top management of the computer s role in attaining the strategic objectives of the corporation.

Author (TAB)

**N68-84701** Harvard Univ., Cambridge, Mass. School of Business.

**COMPUTERS IN BUSINESS AND EDUCATION**

George Kozmetsky 13 Apr. 1967 17 p Presented at the Leatherbee Lecture Ser. on Computers and Management, Harvard Univ., Cambridge, 13 Apr. 1967 *Its* Working Paper No. 67-1

Available Issuing Activity

Trends and opportunities are forecasted for computer usage. The opinion is given that the proper function of business schools is to provide leadership for the evolution of the proper role of present and future computer systems for top management. P.A.B

**N68-84334#** College of Aeronautics, Cranfield (England). Dept. of Mathematics.

**THE PRINCIPLES AND OBJECTIVES OF COST-EFFECTIVENESS ANALYSIS**

A. Stratton Jan. 1968 16 p refs Presented at Roy. Astron. Soc. Rotorcraft Sect. Meeting, London, 10 Aug. 1967

Available Issuing Activity

The principles, method of operation, and objectives of cost-effectiveness are discussed in terms of the analysis technique, its aims, and its limitations. Consideration is given to the basic flow of information and the control processes in two types of decision processes: the requirement method, and the cost-effectiveness method. The operation of the decision and control processes relating performance to cost is depicted to show that for any equipment design the relation between performance and cost follows some law of diminishing returns. Examples illustrate the application of cost-effectiveness analysis in the defense field, and the application of cost-benefit analysis to social projects. M.G.J.

**N68-84150** Oklahoma State Univ., Stillwater.

**A SURVEY OF RESEARCH DOCUMENTATION SYSTEMS IN SELECTED GOVERNMENT AGENCIES**

George Curtis Bucher (Ph.D. Thesis) 1966 126 p

Available from Univ. Microfilms: HC $6.20/MF $3.00 Order No. 67-7197

A literature review and a field survey of selected Federal Government agencies were conducted for the purpose of determining types of research documentation in use and their adequacy. The findings show that the existing research documentation systems in the government agencies surveyed allow room for improvement. There is a need to improve documentation covering the over-all research program as well as documentation covering specialized areas of research work. Formal written summary-type progress reports are the most-preferred type of research documentation by managers in the agencies surveyed. Oral presentations rank second. In the larger government agencies surveyed, more frequent internal research reviews are held than in the smaller agencies, but the reviews cover smaller parts of the over-all research program. Dissert. Abstr.

**N68-82769*** California Univ., Berkeley. Space Sciences Lab.

**THE IMPLEMENTATION OF OPERATIONS RESEARCH: A STUDY OF SOME ASPECTS THROUGH MAN-MACHINE SIMULATION**

Jan H. B. M. Huysmans (Ph.D. Thesis) Jan. 1968 281 p refs *Its* Internal Working Paper No. 78

(Grant NSG-243)

(NASA-CR-93168) CFSTI: $3.00

This study defines the objective of Operations Research (O.R.) as improving the operation of an organization, and then proceeds to provide evidence that illustrates how little of this objective has been realized in O.R. practice. This lack of successfulness appears not due to lack of theoretical progress, but rather to a disinterest in or an improper handling of the problems of O.R. implementation. Joint (simultaneous) consideration of all constraints at the beginning of a research project is considered necessary if organizational improvement is to be accomplished, and these considerations provide the basis for the research- and implementation-strategy presented. Attention is focused on a restricted research implementation problem in which the technical superiority of the research is not questioned, but in which implementation constraints are effective that prevent the realization of the proposed organizational improvement. A laboratory experiment was chosen as a testing ground for the hypotheses. Experimental control was resolved by placing the subject in a rich and complex semi-computer controlled environment, with human editors used as interface between the computer and the experimental subject. Experimental data support the main hypotheses of the study. A.L.

**N68-82585** National Bureau of Standards, Washington, D. C. Technical Analysis Div.

**QUANTITATIVE METHODS FOR MANAGEMENT**

George Suzuki May 1967 15 p refs

(PB-176109; NBS-TN-414) CFSTI: HC$3.00/MF$0.65

An elementary treatment is provided on some of the better known and widely used analytical methods in operations research—systems analysis. The material is presented in a manner which attempts to indicate why quantitative methods are useful in managerial decision-making situations. Some basic references are provided. Author (USGRDR)

**N68-81001#** Air Force Office of Scientific Research, Washington, D. C. Directorate of Information Sciences.
**MOVE THE INFORMATION: A KIND OF MISSIONARY SPIRIT**
Rowena W. Swanson Jun. 1967 203 p refs Presented at 75th Ann. Meeting of the Am. Soc. for Eng. Educ., East Lansing, Mich., 19-22 Jun. 1967
(AD-657794; AFOSR-67-1247) CFSTI: HC $3.00/MF $0.65

The paper records (A) plans and activities in the development and implementation of information systems in a variety of library and information center environments, and (B) plans and programs for the education and training of people for the information, computer, and library sciences. The section on systems considers, in turn, the academic library, the public library, the industry-oriented library, and management applications. The discussion of accomplishments for these environments highlights not only mechanization of operations, but also user needs and how they are being met. Curriculum development in the computer sciences is considered with respect to factors arising from its multidisciplinary character and its vocation-type aspects; and its potential impact, via computer-assisted instruction, on teaching methods and fundamental questions concerning education. A bibliography is included. Author (TAB)

**N68-34716#** Michigan Univ., Ann Arbor. Dept. of Industrial Engineering.
**CRITICAL PATH METHOD: A REVIEW**
M. Krishnamoorthy 1968 112 p refs
(Grant DA-ARO(D)-31-124-G767)
(AROD-5447-5-M; TR-1968-4; AD-672522)

The paper brings together different aspects of the Critical Path Analysis exclusively in terms of the mathematical developments in this area during the last eight years. The survey is divided into seven sections. The first one deals with the four stages of development, each successive stage being more representative of the real situation. The next five sections give explicit reference to the different articles which contribute to the stages of development described in the first section. The articles are reviewed in terms of the network algebra, PERT assumptions, cost/time trade off, resource allocation (heuristic) and resource allocation (analytical). Finally, the seventh and last section of this paper provides a summary of ideas and possible directions of research, some of which are currently being undertaken. Author (TAB)

**N68-20958#** Logistics Management Inst., Washington, D. C.
**DEFENSE INDUSTRY VALUE ENGINEERING PROGRAM REVIEW**
Feb. 1968 64 p refs
(Contract ARPA SD-271)
(AD-665679)

Significant opportunities appear to exist for increasing defense industry participation and effectiveness in the DoD Value Engineering Program through stimulating a much greater exploitation of the savings sharing potential of industry-initiated Value Engineering Change Proposals (VECPs). It is concluded that defense industry will probably increase its VECP activity significantly: (1) When it is generally convinced that its DoD customer is receptive to industry-initiated VECPs. (2) When DoD VECP processing time is reduced and the quality and quantity of VECP feedback information are improved. (3) If the DoD closely monitors experience and problems under the current VE Armed Services Procurement Regulation provisions and makes timely corrections as necessary to maintain strong industry motivation. (4) If all concerned DoD and defense industry personnel have a thorough understanding of the intent, objectives and procedures of the DoD VECP Program. Author (TAB)

**N68-18629#** Joint Army-Navy-Air Force Fuze Committee, Washington, D. C.
**TECHNOLOGICAL FORECASTING Final Report**
H. T. Darracott, J. W. Sterling, M. J. Cetron, H. A. Welis, D. B. Keckler et al 30 Jun. 1967 146 p refs
(AD-664165)

The report promotes the utilization of a system of logical analysis which, when applied to pertinent technological data, can result in credible and explicit technological conclusions. To this end, the study group attempted to evaluate, by survey and literature, possible forecasting techniques and conceptual approaches to technological forecasting. The manual is directed toward scientific or engineering specialists who may be asked to contribute inputs to forecasts but who may have only limited understanding of technological forecasting and its possible approaches and problems. It attempts to clarify a complex, controversial subject and recommends increased use of a number of techniques and a synoptic viewpoint that can improve the credibility and utility of forecasts provided by these specialists. The guide may also be of interest to users of such forecasts and, hopefully, will promote greater acceptance by providing an explanation of the rationale and methods of technological forecasting. An extensive bibliography on technological forecasting and an index is included in the report. Author (TAB)

**N68-17866#** Stanford Univ., Calif. Dept. of Statistics.
**MODELS FOR COMPETITIVE BIDDING UNDER UNCERTAINTY**
Armando Ortega Reichert 2 Jan. 1968 279 p refs
(Contracts Nonr-225(53); Nonr-225(89)
(TR-103; TR-8; AD-663909)

The study analyzes competitive bidding processes as strategy decision problems under uncertainty. In bidding, a decision-maker may have uncertainty about several factors: the reliability of his information, the payoff he will accrue if his bid is successful, his competitors decision process, and their reaction to the outcome of a bidding process. Quantitative models are developed to incorporate the interrelationship of these factors in the form of competitive games. TAB

**N68-15996*#** Indiana Univ. Foundation, Bloomington. Aerospace Research Applications Center.
**AN EXPLORATORY STUDY OF INDIVIDUAL INFORMATION-PROCESSING AND DECISION-MAKING Final Report**
David W. Cravens (Ph.D. Thesis) 15 Aug. 1967 213 p refs
(Contract NSR-15-003-055)
(NASA-CR-92584) CFSTI: HC $3.00/MF $0.65 CSCL 05I

The overall objective of the study is an exploratory investigation of the possible correlates of individual information processing which takes place in solving technical tasks associated with research and development projects and programs. More specifically, the effort is intended to seek out the apparently important variables relating to information processing, the individual, and the task within a given environment; link these variables into a conceptual analytical structure; and then investigate the existence of relationships among the variables via a field study. The study consists of four interrelated phases. The first concerns the identification and evaluation of applicable research foundations. The second phase involves the development of a conceptual system of variables for use in identifying potential relationships and investigating them empirically. The third phase deals with the specific methodology utilized in the study. The final phase concerns the analysis of the empirical data of the study utilizing canonical analysis. The conceptual system of variables appears to be highly associated, with certain variables playing more important roles in the system than others. Author

**N68-15843#** Aerospace Corp., El Segundo, Calif.
**TECHNICAL DIRECTION AND EVALUATION OF COST ANALYSIS FOR SPACE SYSTEM STUDIES**
Joseph A. Neiss and Herbert Brown (AFSC, Los Angeles, Calif.) May 1967 45 p refs
(Contract AF 04(695)-1001)
(TR-1001(2515-01)-2; SSD-TR-67-98; AD-662886)

Economic and cost effectiveness analyses of proposed system concepts have become vital requirements in virtually all U. S. Air Force Space Systems Division studies. Since development of a space system is extremely costly, lead time is lengthy, and budget limitations are severe, there is a clear need to forecast the total systems cost and effectiveness of a proposed new system as early in the planning cycle as possible. This report presents highlights of the significant aspects of technical direction efforts in systems cost and cost effectiveness analyses. Major objectives of this effort are to ensure that the industry contractor: (a) Performs a total system cost analysis of sufficient depth and validity to permit analysis and evaluation; (b) Identifies those operational design and hardware concepts which will provide the greatest savings in total systems cost; (c) Properly validates those significant concepts and cost relationships which will lead to the selection of an optimum configuration. Recommendations on the approach and techniques to fulfill these objectives are provided. The uses and limitations of industry cost models, cost estimating relationships, and other estimating methods are discussed. Common pit-falls in system cost analysis are illustrated to indicate the guidance necessary. TAB

**N68-15502*#** Indiana Univ. Foundation, Bloomington. Aerospace Research Applications Center.
**MANAGERIAL COST ACCOUNTING FOR A TECHNICAL INFORMATION CENTER**
John G. Helmkamp Jan. 1968 308 p refs
(Contract NSR-15-003-055)
(NASA-CR-92640) CFSTI: HC $3.00/MF $0.65 CSCL 05A

A two-fold solution to the cost information deficiency problem is proposed. A formal managerial cost accounting system is designed expressly for the two information services of retrospective search and selective dissemination. The system was employed during a trial period to test its effectiveness in a technical information center. Once appropriate service cost data are available, the statistical cost model developed in this study can be used in lieu of the formal cost accounting system and will provide an efficient and economical cost control technique. A computerized data processing function is employed to convert cost data recorded during the production process on various source documents into relevant managerial cost information. A random sample of five searches is selected every month for both information services, and the direct costs consumed for each sampled search are registered on a single record. Author

**N68-15120*#** Serendipity Associates, Chatsworth, Calif.
**A DESCRIPTIVE MODEL FOR DETERMINING OPTIMAL HUMAN PERFORMANCE IN SYSTEMS. VOLUME 2: PART A: SYSTEM DEVELOPMENT ACTIVITIES CONCERNED WITH PUTTING MAN IN AN AEROSPACE SYSTEM. PART B: DEVELOPMENT OF MAN–MACHINE SYSTEMS: SOME CONCEPTS AND GUIDELINES**
Washington, D. C. NASA Jan. 1968 380 p refs
(Contract NAS2-2955)
(NASA-CR-877, V. 2) CFSTI: HC $3.00/MF $0.65 CSCL 05H

The design and control of each of the identified man-related activities in an aerospace system model are described. Consideration is given to planning and controlling each activity in the system development cycle which pertains to the production of man-related end products such as trained personnel, job aids, and human-engineered interfaces. Each man-related activity is discussed in the context of the overall development cycle objectives which are dependencies upon other activities, demands of other activities, activities interactions, and the process of conducting the activity. The identified man-related activities are described in terms of activity groups. Selected terms are given for the common vernacular of the biotechnology and system engineering community. Tools for synthesizing aerospace systems are included with emphasis on the design and development of the man-related features of man–machine systems. B.S.D.

**N68-13387#** Tracor, Inc., Austin, Tex.
**DATA MANAGEMENT: A COMPARISON OF SYSTEM FEATURES**
Theodore W. Ziehe Oct. 1967 43 p refs
(Contract N00014-67-C-0396)
(TRACOR-67-904-U; AD-661861)

Features of four data management systems under development are compared. The four systems are the Time-Shared Data Management System (System Development Corporation) and a variant of it, the Remote File Management System (Computation Center, The University of Texas); Data Manager - 1 (Auerbach Corporation); the Generalized Information System (IBM); and the Catalog System (The RAND Corporation). Comparisons are drawn in two areas: external and internal data structuring and organization. Several differences among the systems are noted and briefly discussed. Author (TAB)

**N68-13204#** System Development Corp., Santa Monica, Calif.
**AN ANALYTICAL COST COMPARISON OF COMPUTER OPERATING SYSTEMS**
Warren J. Erikson 30 Jun. 1967 203 p refs
(Contract F19628-67-C-0004)
(SDC-TM-3525; AD-661983)

The report attempts to answer some of the questions concerning the advantages and disadvantages of time-sharing. To accomplish this, the general problem of evaluating computer system performance is first addressed. General system characteristics are specified that include the computer and its operating system, and users and their jobs. The main emphasis is placed upon the operating system; the effects of having different computers, users, or jobs are treated as parameters. The most important evaluation criterion is considered to be cost, which includes both user cost and computer system cost. Quantitative models are developed that describe computer center users, the programs they run, and the different operating systems they might use. TAB

**N68-13095#** Mitre Corp., Bedford, Mass.
**A SYSTEMATIC PROCEDURE FOR ASSESSING THE WORTH OF COMPLEX ALTERNATIVES**
James R. Miller Nov. 1967 204 p refs
(Contract AF 19(628)-5165)
(MTR-260; ESD-TR-67-90; AD-662001)

The paper addresses itself to the problem of assessing worth. It is assumed that a decision context has been specified and that a fixed set of discrete alternatives has been produced. It then remains to assess the worth of each alternative, to estimate the resource drains required by each, and to combine these considerations, along with considerations of risk/uncertainty, so as to arrive at a final decision. The bulk of this paper is directed toward worth assessment. To aid in the assessment process, a detailed procedure has been devised. The purpose of this procedure is set forth, and step-by-step instructions for its actual implementation are presented. A live instance of its complete application is also provided for illustrative purposes. Major conclusions are that the procedure can be carried out successfully--at least by professional decision makers in a laboratory setting--and that all phases of it exert an important impact upon the decision making process. Critical to its overall impact, and particularly to its success, are its quantitative aspects. Author (TAB)

**N68-12069#** *Mitre Corp., Bedford, Mass.*
**EVALUATION OF ADAM: AN ADVANCED DATA MANAGEMENT SYSTEM**
Robert A. J. Gildea Aug. 1967 68 p refs
(Contract AF 19(628)-5165)
(MTR-442; ESD-TR-67-130; AD-661273)

The report evaluates the ADAM project (Advanced Data Management System), its products, applications, and some of its activities, which were part of a larger project entitled Information Systems Tools and Software Techniques. The knowledge and conclusions contained herein are intended for Air Force and other personnel who either are systems programmers or have had a brief technical orientation in information processing systems, and are interested in the management and production of software tools. There are detailed evaluations of documentation and debugging facilities, system languages and language manipulators, data structures and memory allocators. Both the design and implementation of parts of the system, as well as the entire system are discussed. Author (TAB)

**N68-11956*#** National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
**A GRAPHICAL COSTING PROCEDURE FOR ADVANCED MANNED SPACECRAFT (MASCOT G)**
H. C. Mandell Oct. 1967 62 p refs
(NASA-TM-X-58012) CFSTI: HC $3.00/MF $0.65 CSCL 14A

The method presented is based on a series of log–log graphs of reference cost data points, allowing cost comparisons to be made in three parametric dimensions: absolute cost, subsystem size (weight), and subsystem complexity (cost per pound). Both nonrecurring and item costs are presented. Techniques are presented to build module and total project-level costs from the sums of subsystem-level costs. These techniques are a series of ratios between corresponding levels of historical program-level, module-level, and subsystem-level costs. An example problem is presented to illustrate the use of the historical data for estimating the costs of an advanced module The Apollo lunar module was chosen so that results could be compared with actual program data. Author

**N68-11306#** Naval Personnel Research Activity, San Diego, Calif.
**APPLICATION OF AUTOMATIC DATA PROCESSING TECHNIQUES TO TASK ANALYSIS DIAGRAMMING Final Report**
David A. Wilson Oct. 1967 37 p refs
(SRM-68-8; AD-660002)

The purpose of this exploratory project was to develop automatic data processing (ADP) techniques applicable to the construction and revision of task analysis diagrams during final development of a new system. The report presents a procedural guide to a simple experimental method of using automatic data processing in the production and revision of task analysis diagrams. Such techniques will be of benefit to both in-service and contract analysts in quickly and economically producing and revising such diagrams, as changes in system and hardware design are considered and incorporated into production-configured equipment. The resulting documents will provide a common informational tool to a variety of users in their effort to optimize the preparation and performance of the operator and technician. To avoid the necessity of security classification, the examples in this report are hypothetical, although they describe familiar types of equipment and procedures. A validation field test of this method, applied to an actual system under development, is planned for Fiscal Year 1968. Author (TAB)

**N68-10585#** Aerospace Corp., El Segundo, Calif.
**USE OF AN EMPIRICAL PRODUCT-ORIENTED COST DATA BANK FOR PREDICTING AND NEGOTIATING FUTURE SATELLITE SYSTEM COSTS**
Hyman Silver Jun. 1967 29 p
(Contract AF 04(695)-1001)
(TR-1001(2573-34)-1; SSD-TR-67-150; AD-659329)

This report outlines and analyzes one approach toward solving the generalized problem of poor cost estimating procedures within the aerospace industry. This approach deals with the replacement of the traditional functional system of estimating, negotiating and reporting costs with the product or end item oriented technique. Specifically, the military Comsat IDCSP program end item cost system is described, and the manner by which it was used to form a comprehensive cost data bank and the subsequent usage of the data bank to estimate new program costs are analyzed. It also describes the benefits accruing to the understanding of both parties in negotiating contract costs that have been estimated on a detailed product oriented basis. The actual re-estimating procedures that were utilized on a current Comsat program are described in detail. Author (TAB)

# M5 PERSONNEL MANAGEMENT

**N68-88317*** California Univ., Los Angeles. Graduate School of Business Administration.
**PERSONNEL POLICY AND AGING ORGANIZATIONS**
William H. McWhinney Jul. 1966 34 p refs
(Grant NsG-237)
(NASA-CR-83388; RP-15) CFSTI: $3.00

An initial exploration of one segment of the conditions producing organizational aging in the context of research and development organizations is reported; a theoretical approach is built for utilizing the information gained in the study of extant organizations, and strategies are developed aimed at the mitigation of various weaknesses occurring in the aging syndrome. The study is limited to a consideration of the effects of personnel policies which determine the acquisition, movement within the organization, and separation of employees. The range of alternative personnel policies considered by an analysis of the transition process is widened, using the general notion that a policy is a form of a forcing function operating on a stochastic representation of the transition process. An approach to modeling the personnel process is discussed, and some hypothetical policies are examined. Some of the costs and advantages which must be considered when selecting a personnel management policy are discussed. Data from an actual R & D facility is used to exemplify one policy. Author

**N68-87214** Massachusetts Inst. of Tech., Cambridge. Alfred P. Sloan School of Management.
**PROJECT MANAGER SELECTION: THE DECISION PROCESS**
*Andrew G. Swanson Sep. 1964 19 p refs*
(Rept.-70-64) Available Issuing Activity

Several executives with responsibility for selecting managers in a government research laboratory were interviewed to investigate the process of making the selection decision. Actual people and situations were discussed. The interview data make it clear that the process of selecting project managers is an understandable and describable process even though it is carried out in an informal and mostly subconscious manner. A model of the decision process is presented. Data from a limited test were in accord with the

model. The pattern found in the selection process has possible application to improvement of the particular decision process studied and also to the more general understanding of decision processes. Author

**N68-84192** Minnesota Univ., Minneapolis.
**ROLE DEFINITION AND PERFORMANCE APPRAISAL IN MANAGEMENT**
Stanley Russell Strong (Ph.D. Thesis) 1966 222 p
Available from Univ. Microfilms: HC $10.15/MF $3.00 Order No. 67-7791

The influence of superior, peer, and subordinate status relationships on descriptions of supervisory behavior and evaluations of job performance in management are investigated. The study was based on the hypothesis that a manager's superiors, peers, and subordinates have different ideas about how he should behave and that, as a result, they actually perceive him as behaving differently. These different ideas of how the manager should behave were conceptualized as different definitions of the manager's role. The following hypotheses were tested: (1) focal managers and their superiors, peers, and subordinates have different definitions of the focal managers' role; (2) role definition influences behavior descriptions more than the actual job behaviors of the persons described; (3) appraisals of job performance are dependent on fulfilling role expectations; and, (4) differences among the behavior descriptions of focal managers by superiors, peers, and subordinates are related to differences among their appraisals of the job performance. Dissert. Abstr.

**N68-84191** Minnesota Univ., Minneapolis.
**AN EMPIRICAL EVALUATION OF SELECTED HYPOTHESES FROM A THEORY OF WORK ADJUSTMENT**
Robert E. Carlson (Ph.D. Thesis) 1965 262 p
Available from Univ. Microfilms: HC $11.95/MF $3.40 Order No. 67-8069

The three hypotheses evaluated were as follows: (1) Measures of correspondence between abilities and job requirements will correlate with satisfactoriness, the degree of correlation varying with the level of job satisfaction. (2) Given high job satisfaction, mean level satisfactoriness will be higher for individuals who are correspondent (qualified) than for workers who are noncorrespondent (under and overqualified) on any ability dimensions; and, given low job satisfaction, mean level satisfactoriness will be higher for workers who are underqualified on any ability dimension than for workers who are qualified and overqualified. (3) Average job tenure will be highest for the group of high satisfaction-high satisfactoriness workers and lowest for the group of low satisfaction-low satisfactoriness workers, when the level of job tenure is adjusted for selected constraints. Dissert. Abstr.

**N68-84148** Wayne State Univ., Detroit, Mich.
**A STUDY OF THE USE AND IMPACT OF VERBAL COMMUNICATION PROCESSES IN PSYCHOLOGICAL COUNSELING INVOLVED IN THE DEVELOPMENT OF MANAGEMENT EMPLOYEES IN A BUSINESS ORGANIZATION**
Robert Calvin McCoy (Ph.D. Thesis) 1966 276 p
Available from Univ. Microfilms: HC $12.00/MF $3.45 Order No. 67-672

A specific communication process, the Personal Study as developed and practiced by a private firm of consultants, and as applied particularly in the cases of 124 insurance management employees over a period of 12 years, was described in detail and analyzed as to objectives, goals, and procedures. This communication experience was then subjected to study on the basis of all objective, subjective, and historical data available. This data included: promotability predictions made in 1953, the promotion record of the managers in 1965, a record of counseling utilization, a survey conducted among the subject managers in 1965, and a special depth analysis by judges. The primary hypothesis that this process results in an individual manager's gaining a recognition of his own personal strengths and growth needs toward the end of self-improvement was basically supported in terms of the nature of the evidence related to five subhypotheses. Dissert. Abstr.

**N68-84144** Connecticut Univ., Storrs.
**A MODEL FOR ESTABLISHING AN OBSOLESCENCE INDICATION FOR PRACTICING ELECTRICAL ENGINEERS**
Paul Mali (Ph.D. Thesis) 1966 192 p
Available from Univ. Microfilms: HC $8.80/MF $3.00 Order No. 67-3900

The basic approach was to obtain agreement from a jury of consultants on a listing of new technologies of recent advance and apply it to practicing engineers who self-determine what they believe to be their level of understanding of each of these technologies. An obsolescence index was utilized to measure the deviation from the jury established criteria which was used as a model for the study. The major findings include: (1) Fourteen new or expanding technologies were recognized by a jury of experts as constituting areas of rapid obsolescence. (2) Technical personnel in the field over five years need upgrading in engineering fundamentals in these areas of rapid obsolescence. (3) Currentness in the field was indicated by an obsolescence index and declined with increased chronological age, years out of school, and type of activities in employment. (4) Practicing electrical engineers, on the average, saw themselves as falling behind in the field.
Dissert. Abstr.

**N68-81644** Princeton Univ., N. J. Dept. of Psychology.
**CONCEPTUAL LEVEL AS A COMPOSITION VARIABLE IN SMALL GROUP DECISION-MAKING**
Paul Stager (Ph.D. Thesis) Feb. 1966 88 p refs
(Contract Nonr-1858 (42); Nonr-1858(12))
(AD-657850) CFSTI: HC $3.00/MF $0.65

Decision-making in small groups, varying in composition along a dimension of conceptual level, was investigated from the standpoint of the emergent functional role structure, conflict generation, utilization of conflict in decision synthesis, and information acquisition. The study was directed toward an understanding of the relationship between the conceptual level dimension (the independent variable) and the dependent variables of group information processing structure and specific predecisional processes. On the basis of the conceptual systems theory, several hypotheses were advanced. Each of the hypotheses was confirmed by the obtained results. Author (TAB)

**N68-81582** National Science Foundation, Washington, D. C.
**SCIENTIFIC AND TECHNICAL PERSONNEL IN THE FEDERAL GOVERNMENT, 1964**
Joseph P. Gannon Aug. 1967 40 p refs
(NSF-67-21) GPO: $0.30

Statistical data are provided on the occupational characteristics of the nearly 190,000 professional and 97,000 nonprofessional scientific and technical workers employed by the Federal overnment in December 1964. Included are analyses on occupational trends covering the decade 1954 to 1964, as well as information on growth rates. Author

**N68-81076** Rowland and Co., Haddonfield, N. J.
**THE PROCESS OF PROFESSIONAL INFORMATION EXCHANGE AMONG SCIENCE INFORMATION SPECIALISTS Final Report**
George E. Rowland, Gary L. Hart, Lew W. Cozan, and Richard Faust 1 Jun. 1967 88 p
(Contract NSF C-421)
(R/C-67-7) Available Issuing Activity

The science information specialist has emerged to assist scientists manage their information economically and expeditiously. This study was conducted to define the process of professional information exchange among science information specialists and to identify their requirements. An extensive nationwide field survey was made by interviewing 127 science information specialists who were located in 72 different qualified science information centers. An effort was made to select from each organization one subject who was actively engaged in performing tasks necessary to provide science information to scientists, and one who administered or supervised the performance of those tasks. The data collected indicates that the science information specialist is educationally and functionally different from the librarian; that the process of science information exchange among science information specialists is inadequate and needs considerable revision; and the government, industry, and academic institutions should all become involved in constructing a better communication system. Author

**N68-20483*#** Washington Univ., St. Louis, Mo. Dept. of Economics.
**THE SHORTAGE OF SCIENTISTS AND ENGINEERS**
Hugh Folk Feb. 1968 387 p refs *Its* Working Paper No. 6802
(Grant NsG-342)
(NASA-CR-93776) CFSTI: HC $3.00/MF $0.65 CSCL 05I

The labor market for scientists and engineers is examined in terms of the needs and salaries offered by business, research laboratories, government, and universities. Eight types of shortages and possible solutions to significant problems are considered under the general headings of salary rise shortage, dynamic shortage, controlled price shortage, projected supply shortfall, inelastic supply, national policy goal, limited pool of ability, and utilization of manpower. Both demand and supply for engineers and scientists are detailed, as is the functioning of this specialized labor market. Economic returns and outlook for employment are also treated in terms of types of positions, level of educational achievement, lifetime earnings, and other variables. M.W.R.

**N68-13011*#** Washington Univ., St. Louis, Mo. Dept. of Economics.
**ORGANIZATIONAL EFFECTS UPON MANPOWER UTILIZATION IN RESEARCH AND DEVELOPMENT**
Richard A. Goodman (Ph.D. Thesis) Dec. 1967 178 p refs *Its* Working Paper No. 6715
,Grant NsG-342)
(NASA-CR-91280) CFSTI: HC $3.00/MF $0.65 CSCL 05C

The effect of two basic types of organizational form on the stability and flexibility of manpower in research and development companies engaged in various projects for the United States government. Important criteria for selecting one organizational form rather than another were also explored, since such criteria provided the rationale for choosing a specific organizational form. Specifically, the project management and the matrix management forms of organization were investigated within the context of the defense/aerospace sector of the United States economy. A series of hypotheses were developed and tested concerning the influence of these forms of organization on manpower flexibility, turnover, staff planning, and organizational choice. Author

**N68-11097#** Naval Personnel Research Activity, San Diego, Calif.
**THE APPLICATION OF DECISION THEORY AND SCALING METHODS TO SELECTION TEST EVALUATION**
Ervin W. Curtis Feb. 1967 112 p refs
(STB-67-18; AD-659961)

The correlational approach to selection test evaluation was examined and found to have serious limitations. An approach based on statistical decision theory was developed. Two new methods were presented, one called the utility function method and the other the decision-theoretic method. The former involves the comparison of criterion groups in terms of their utility to the institution using the selection test. The decision-theoretic method is based on statistical decision theory and involves the construction of a payoff matrix corresponding to the contingency table relating the test to the criterion. The cell frequencies are weighted in a utility equation by the payoff values in the corresponding cells of the payoff matrix. This utility equation represents a new test evaluation index which directly expresses the utility of the test to the institution using it. Both of these new methods require the measurement of values peculiar to the institution using the test. The utility function method requires that the performance criterion be translated to a utility function; while the decision-theoretic method requires that a payoff matrix be developed which reflects the gains and losses each cell observation represents to the institution. The three methods (correlational, utility function, and decision-theoretic) were compared with tests used to select students for A-Schools in the U.S. Navy. The three methods led to quite different indications regarding the utility of the selection tests evaluated. The two new methods agreed in terms of the proportion improvement over chance prediction provided by the tests while the correlational method tended to underestimate this proportion. TAB

**N68-11019*#** California Univ., Los Angeles. Research Div.
**SMALL GROUPS AND THE PREDICTION OF BEHAVIOR**
Fred Massarik Sep. 1967 19 p refs
(Grant NGR-05-007-090)
(NASA-CR-90247; NASA-RP-22) CFSTI: HC $3.00/MF $0.65 CSCL 05J

Major modes of interpersonal prediction, managerial style in prediction process, and an integrative mode to improve interpersonal predictive outcomes are discussed. Experiential, normative, and research predictions are described. Parallel and separatists modes of dealing with small groups from the manager's vantage point are outlined. An integrative learning/teaching model is suggested that is based on multivariate problems which are socially relevant and interplay among the many forces affecting the small group behavior. N.E.N.

## M6 URBAN MANAGEMENT

**N68-85847*** Indiana Univ., Bloomington. Aerospace Research Applications Center.
**URBAN TECHNOLOGY TRANSFER Final Report**
Joseph Di Salvo and Robert W. Hall 25 Feb. 1968 167 p refs
(Contract NSR-15-003-055)
(NASA-CR-94367) CFSTI: $3.00/MF

Scientific and technical literature was reviewed with various groups of urban planners in an effort to identify potential users of the information in medium size cities and to define their interests in terms of documents and services which could be provided to them. It was found that there is little direct interest in

highly technical scientific reports and no large scale research and development efforts. Interest centered on topics in urban planning and urban transportation planning. Annotated bibliographies of government-indexed reports on these areas are presented. Urban planning topics include: aerospace technology applications; zoning and location studies, budget and costing methods for public projects; noise control; urban development models; urban environmental studies; computer systems applications; urban area social analyses; city-industry interactions; and methodology for location codes and population studies. Urban transportation planning includes: airport planning; high speed ground mass transport studies; street maintenance; transportation terminal traffic flow; freeway traffic models; land use in freeway planning; highway safety; budget and costing methods; traffic flow forecasting; novel mass transit systems reports; and traffic monitoring and control. P.A.B.

**N68-84327** RAND Corp., Santa Monica, Calif.
**INTERDEPARTMENTAL COORDINATION AS A POLITICAL TRANSACTION**
Paul Y. Hammond Jan. 1968 23 p refs Submitted for publication
(AD-664903; P-3738) CFSTI: HC$3.00/MF$0.65

An historical account is given of the growth of interdepartmental coordination in public administration. Specifically, studies on the coordinational activities existing within the U.S. federal government are assessed. Various trends are interpreted in terms of political party policies, economic aims, and Administration viewpoints. B.P.

**N68-83256** American Society for Public Administration, Chicago, Ill.
**FEDERAL AGENCY APPROACHES TO FIELD MANAGEMENT**
Alan L. Dean, ed Sep. 1963 36 p refs Presented at 1963 Natl. Conf. on Public Admin., Washington, D. C., 3–6 Apr. 1963
Available Issuing Activity

High officials of six federal departments describe the field patterns for their agencies, which range from tightly unified organizations in which everything that is done relates to every other thing, to agencies in which programs relating generally to a government purpose (but with few administrative relationships) have been put under a secretary who runs them on behalf of the President. Consideration is given to centralization—decentralization in terms of what should be centralized and decentralized, with what controls, and to what levels. The discussions demonstrate that there is no such thing as a single model plan which the average federal agency ought to have in managing field activities. It is pointed out that agencies must look to their missions, to how their parts relate, and to how widely ramified they are in the field. Then, they should design an approach to field management that is tailored to their needs. M.G.J.

**N68-82782*** California Univ., Berkeley. Space Sciences Lab.
**SYSTEMS ANALYSIS IN GOVERNMENT ADMINISTRATION: A CRITICAL ANALYSIS**
Ida R. Hoos Dec. 1967 17 p refs *Its* Internal Working Paper No. 77
(Grant NSG-243)
(NASA-CR-93167) CFSTI: $3.00

During the past decade, systems analysis has been tried in a variety of contexts, by persons representing different disciplines and exploring a multiplicity of techniques. If the channels of inquiry can remain open, and if professional evaluation can be allowed to emerge, there may develop the methodological and conceptual mutations needed in order to make this technique a more helpful tool in social planning. Economic, political, and social rationality all must play a part in this process. Perhaps the most significant lesson to be derived from the applications to date of systems techniques to new areas has been the discovery of the basically multifaceted nature of every major problem facing the government planner. This would indicate a clearcut need for knowledge on many fronts and the application of many kinds of capabilities. Highly desirable would be a creative synthesis achieved by means of a genuine multi-disciplined effort directed to understanding the problems facing society. Author

**N68-82781*** California Univ., Berkeley. Space Sciences Lab.
**SYSTEMS ANALYSIS IN STATE GOVERNMENT**
Ida R. Hoos Dec. 1967 16 p refs *Its* International Working Paper No. 79
(Grant NSG-243)
(NASA-CR-93166) CFSTI: $3.00

Systems analysis is a method of analyzing a problem by (1) defining it, (2) ascertaining the desired objectives, (3) assessing the available resources, and (4) discovering the optimum alternatives for achieving the objectives. Systems analysis is embodied in the planning—programming—budgeting system and is being implemented at state and local levels to the scientific management approach to government, social problems, and public planning. Public administrators seem universally to regard operations research, program budgeting, cost effectiveness, systems analysis as the storehouse of intellectual technology, from which they may draw tools to improve their decision making. Perhaps the most significant lesson to be derived from the applications to date of systems techniques to civil problems has been the discovery of the basically multifaceted nature of every major problem facing the government planner. his would certainly indicate a clear-cut need for knowledge on many fronts and the application of many kinds of capabilities. Author

**N68-80627#** Analytic Services, Inc., Baileys Crossroads, Va.
**CIVILIAN PUBLIC PROBLEMS AND THE AEROSPACE INDUSTRY**
Ronald P. Black and Charles W. Foreman 16 May 1967 13 p refs Presented at AIAA Meeting, Silver Spring, Md., 16 May 1967
(Contract AF 49(638)-1259)
(AD-660086) CFSTI: HC$3.00/MF$0.65

The paper treats the possibility that the Aerospace Industry could apply its capabilities to the solution of civilian public problems. It examines the relation of the systems approach, as it has been utilized by the aerospace industry in the past, to its possible future use in civilian public areas. It includes a discussion of what an industry move into civilian public areas would imply in relation to the transferability of industry scientists and engineers. It is argued that, in most respects, the domestic issues which face the nation today stem not from the type of technological deficiencies which the aerospace industry has been so successful in overcoming in the past, but rather from an inability of the public and their selected representatives to agree on social and economic objectives. (TAB)

# M7 MANAGEMENT POLICY & PHILOSOPHY

**N68-85360** Naval Personnel Research Activity, San Diego, Calif.
**A PRELIMINARY REPORT ON THE FEASIBILITY OF ORGANIZATIONAL RESEARCH IN THE NAVY**

Joe Silverman Nov. 1967 27 p refs
(AD-665668; SRR-68-8) CFSTI: HC$3.00/MF$0.65

The report presents the results of a preliminary review of the literature in organizational theory, with special emphasis on its feasibility for application to problems of Navy organizational units. The objective of such research would be the development and improvement of naval organizational structures and functions through the use of advanced techniques which integrate organizational theory, modern mathematical methods, and computer technology. A program of organizational research is delineated in terms of the impact of technological change on organizational structures and manpower utilization, which is so manifest in the area of ship and weapons systems design. Such a program would focus on organization structure and design, decision and control processes, measures of organizational effectiveness, intraorganizational communications, and organizational adaptability to change. Some of the problems of Navy shipboard organization in particular, and problems of organizational theory in general, which are discussed include those of organizational goals and purposes, structure and design, and decision-making. Author (TAB)

**N68-85274** System Development Corp., Santa Monica, Calif.
**THE MANAGEMENT OF PROGRAMMED RESEARCH**
Milton G. Holmen 9 Feb. 1966 10 p
(SP-2355) Available Issuing Activity

The management of programmed research, defined as research of such magnitude or under such contract arrangements that the staff must review its plans with another agency, is discussed. The steps involved in developing a management system include: establishing explicit research activity goals; establishing policies for achieving the goals; providing an organizational structure and staff to conduct the research; scheduling the work and budgeting the needed resources; and developing a review procedure by which corporation management can carry out evaluations. Plans for the research program must include consideration for selling the program. A good portfolio of corporate research projects should include some projects with a high probability of payoff, a few highly speculative projects, and a spectrum that closes the gap between these extremes. The steps typically included in a research project are the following: (1) survey of the problem, (2) data collection, (3) conduct of pilot studies, (4) one or more crucial experiments, and (5) documentation on each major phase of the research project. Problems relating to the motivation of research workers and improvement of interaction between the research staff and other portions of the organization are also discussed. Author

**N68-84704** Texas Univ., Austin. College of Business Administration.
**PATTERNS OF ACTIVITIES OF ORGANIZATION DEPARTMENTS: A PRELIMINARY ANALYSIS**
William F. Glueck Jul 1967 27 p refs *Its* Working Paper No. 67-12
Available Issuing Activity

Research into the objectives, leadership, accomplishments, activities, and activity patterns of corporation organization departments is reviewed. It was found that the departments pursue four major objectives: (1) helping the firm achieve efficient use of its human resources; (2) helping the company to adapt to internal and external changes so that it is organized to achieve its current, rather than past, goals; (3) preventing excessive or poorly planned organization change; and (4) helping to minimize conflict within the organization. The results of investigations into the educational and business backgrounds of department leaders are given. Tabulations of questionnaires sent to organization departments, concerning a relative rating of their activities, are discussed and evaluated. Activities are divided into the categories of most important, routine and necessary, and mundane and necessary. Activity patterns are discussed in terms of organization development approach and organization planning approach models. P.A.B.

**N68-84675** Texas Univ., Austin. College of Business Administration.
**MANAGEMENT OF SPACE ENTERPRISES**
George Kozmetsky [1968] 13 p
(AAS-67-13) Available Issuing Activity

A management control system is considered for technical, production, financial, and contractual management of programs organized for large scale projects or for technologically based equipment industries. The general concept for the method used is that in the course of the program development a subjective and quantitative evaluation must be made of the probability with which a system and related equipments under development will meet their specifications. A set of related networks for each system to be examined is prepared as to its economy in fulfilling the mission requirements. These networks have their foundation in the information matrices provided by state of the art, knowledge, and research and development and include: (1) a system simulation network (the computerized version of the system functional diagram and its related error analysis); (2) a PERT time network for development and the PERT/LOB for production; (3) a PERT cost network; (4) a system effectiveness network; and (5) a cost effectiveness network. An integrated management control system is also discussed to show how program planning can be effectively supported. B.P.

**N68-80441*** National Aeronautics and Space Administration, Washington, D. C.
**MANAGEMENT BY OBJECTIVE: IT'S FOR EDITORS TOO**
George J. Howick 13 Oct. 1967 50 p Presented at the Am. Soc. of Business Press Editors Natl. Conf., Cleveland, 13 Oct. 1967
(NASA-TM-X-60598) CFSTI: $3.00

Management by objective is defined as a system to specify the something, assign the someone, motivate him, and integrate his efforts with those of others to provide a worthwhile result that can be viewed with pride by all who contributed to it. Twelve critical functions of a manager are listed: define purposes, formulate objectives, sense opportunities, organize resources, provide incentives, establish communication networks, provide for feedback, accept total responsibility, develop and communicate strategies, encourage tactical experimentation, provide leadership, and measure results. Advantages of management by objective are cited: (1) It helps you set priorities. (2) It gives you a better basis for measuring the true contribution of an employee. (3) It permits a coordinated effort. (4) It pinpoints responsibilities. (5) It forces you to plan and to chart your course in advance. (6) It offers a decision-making framework. (7) It aids in deriving the optimum span of control. (8) It encourages risk-taking. M.G.J.

**N68-29601*#** Michigan Univ., Ann Arbor. Center for Research on Utilization of Scientific Knowledge.
**ORGANIZATIONAL BEHAVIOR RESEARCH UTILIZATION PROCESSES. A STUDY OF PROCESSES FOR THE UTILIZATION OF SCIENTIFIC FINDINGS FROM ORGANIZATIONAL BEHAVIOR RESEARCH Final Report**

27 Oct. 1967 196 p
(Grant NGR-23-005-116)
(NASA-CR-89837) CFSTI: HC $3.00/MF $0.65 CSCL 05J

Seminars, individual questionaires, evaluation sheets, and assessment sheets are employed as techniques for utilization of organizational behavior research knowledge by a specific complex organization element. The organizational research material selected for use pertained to promotion of new patterns of management and motivational approach to supervision, personnel performance and productivity, and most effective practices of supervision and management of professional and scientific personnel. Problems of supervision and management in the specified organization element are identified, described, and assessed. Feasibility of applying research knowledge to such problems is determined. Alternative methods which could be used to transfer and apply research knowledge to management problems are developed and evaluated. Summary conclusions offered are that the seminar approach is an effective method of transferring behavioral science research knowledge to managers, and that the several utilization techniques must be viewed in terms of characteristics of the using organization and its leadership. D.H.B.

**N68-15494*** California Univ., Los Angeles. Graduate School of Business Administration.

**AN IDENTIFICATION AND ANALYSIS OF ORGANIZATIONAL BARRIERS TO INNOVATION**

L. Glen Strasburg Nov. 1967 28 p
(Grant NGR-05-007-090)
(NASA-CR-91664; RP-23) CFSTI: $3.00 CSCL 05A

Barriers that might hinder creativity and innovation at a large governmental theoretical engineering laboratory were studied, and data from a second laboratory engaged in exact design and hardware development are being processed for a comparative analysis. Based on barriers reported by a representative sample of technical people, it is concluded that creativity and innovation are adversely affected because technical staff wants to be recognized for personal contribution and rewarded, particularly in terms of nonmonetary recognition. Further, they want to be stimulated at the working level, told what is going on, and have their ideas heard by management. M.W.R.

# M8 ECONOMICS

**N68-86688*** Washington Univ., St. Louis, Mo. Dept. of Economics.

**AEROSPACE TECHNOLOGY AND THE FEDERAL BUDGET**

Murry L. Weidenbaum Jul. 1968 21 p refs Presented at the Conf. on Impact of Aerospace Sci. and Technol. on Law and Govt., Washington, D. C.; Sponsored by AIAA and Am. Bar Assoc. *Its* Working Paper 6808
(Grant NsG-342)
(NASA-CR-92507) CFSTI: $3.00

The changing size and composition of federal expenditures for aerospace science and technology are treated. The likely availability of federal money to finance further expansions in these fields during the period following the end of the war in Vietnam is shown. New methodologies for allocating public resources among aerospace and other program areas are presented and analyzed. Author

**N68-85823*** Washington Univ., St. Louis, Mo. Dept. of Economics.

**IMPACT, PATTERN, AND DURATION OF NEW ORDERS FOR DEFENSE PRODUCTS**

Maw Lin Lee Apr. 1968 24 p refs *In its* Working Paper 6805
(Grant NsG-342)
(NASA-CR-94326) CFSTI: $3.00/MF

An exploratory study is presented on an econometric model which considered the impacts of government actions on the economy. Defense procurement is the instrumental variable used for the model and the relationships between new orders and shipments are specifically investigated. The statistical estimates of the parameters of the functions of inventory and shipments on lagged orders indicated that the impacts of defense procurement on economic activity are spread over a period of approximately two to two and one-half years. The statistical results supported the hypothesis that the state of technology and the nature of products influence the impact, pattern, and duration of defense procurement as evidenced in the relations of product mix to inventories and shipments. In addition, the rate of capacity utilization also has effects on inventory build-up and shipments. B.P.

**N68-37813*#** Washington Univ., St. Louis, Mo Dept. of Economics.

**A MODEL OF THE DISTRIBUTION OF FEDERAL EXPENDITURES AMONG STATES**

Maw Lin Lee and Louis Silversin Oct. 1968 21 p 7 refs *Its* Working Paper No 6817
(Grant NsG-342)
(NASA-CR-97358) CFSTI: HC $3.00/MF $0.65 CSCL 05C

The statistical model was developed on the assumption that the distribution of federal expenditures is governed by the objectives and functions of federal programs to deal with social and economic problems and to procure goods and services for government. Social and economic problems as well as the ability of a state to function as a supplier to the federal government are assumed to be associated with the extent of its industrialization, urbanization and other factors. These factors are incorporated to explain the distribution of federal expenditures. The results in general are consistent with the hypotheses. The simultaneous equation approach is still in its infancy as an analytic tool for government fiscal activity. For this reason, the statistical model developed and applied here should be considered as an exploratory one. But the study illustrates that this research methodology can be fruitfully applied to the investigation of the distribution of federal expenditures among regions and states. Author

**N68-33201*#** Washington Univ., St. Louis, Mo. Inst. for Urban and Regional Studies.

**IMPACT OF FEDERAL PROCUREMENT ON PERSONAL INCOME DISTRIBUTION**

Gerald W. Williams (Ph.D. Thesis) Jul. 1968 112 p refs Sponsored in part by the Econ. Develop. Admin.
(Grant NsG-342)
(NASA-CR-96469; EDA-11) CFSTI: HC $3.00/MF $0.65 CSCL 05C

The increase in Federal spending, both for defense and nondefense purposes, has heightened people's interest in the consequent economic impacts of these new expenditures. Most economists generally acknowledge that such changes in spending affect the economy chiefly by altering aggregate income. However an alteration in Federal expenditures may also change personal distribution of income. There has been little systematic analysis in studying this distributional impact, and the past studies possess numerous shortcomings. The present research directs itself toward filling this gap. Specifically its purpose is to measure the income

redistribution that occurs given a change in the level or composition of expenditures of the Federal government. The analysis is further concentrated on the distributional impact of Federal purchases of goods and services, and the implications that follow from such a measurement. Author

**N68-24924*#** Syracuse Univ., N. Y.
**THE IMPLICATIONS OF PRESIDENT JOHNSON'S MEMORANDA OF SEPTEMBER 13 AND 14, 1965, FOR THE FUNDING OF ACADEMIC RESEARCH BY FEDERAL AGENCIES, PART 2**
*James D. Carroll* [1967] 326 p refs
(Contract NASr-206)
(NASA-CR-85721) CFSTI: HC $3.00/MF $0.65 CSCL 05A

The purpose of this study was to examine the policies and procedures used by federal agencies in funding academic research, and to assess the implication of President Johnson's Memoranda of September 13 and 14, 1965, for the development of these policies and procedures. This study argued that the academic research funding system was subjected to four major demands in the 1960's: the demand for responsibility in the administration of funds, the demand for equity in the distribution of funds, the demand for the use of educational criteria in the administration of funds, and the demand for an increase in efforts to apply science to social needs. It is concluded that the President's Memoranda indicate the further recognition of institutions, as institutions, as the proper recipients of funds. It is further concluded that the project system should be retained in the primary method of funding research for the advancement of science and the realization of agency missions and that a new funding system based on regional considerations should be developed. Author

**N68-24640*#** Syracuse Univ., N. Y.
**THE IMPLICATIONS OF PRESIDENT JOHNSON'S MEMORANDA OF SEPTEMBER 13 AND 14, 1965, FOR THE FUNDING OF ACADEMIC RESEARCH BY FEDERAL AGENCIES, PART 1**
James D. Carroll 1967 251 p refs
(Contract NASr-206)
(NASA-CR-86739) CFSTI: $3.00 CSCL 05A

This study aims to review and examine selected aspects of the policies and procedures of federal agencies in funding academic research, with emphasis on the period 1960 to 1965, and to analyze the implications of demands for changes as expressed in the President's Memoranda. The ultimate purpose of the study is to contribute to an understanding of basic issues involved in such funding in the 1960s and 1970s and to provide suggestions for resolving these issues. The study is limited to the demands for change as exemplified in President Johnson's Memoranda, which direct agencies to allocate research funds to more institutions than in the past, and to provide broader forms of support to researchers and institutions. Other major topics of the study are: (1) the federal academic research funding system and its impact on the financial structure of higher education in the United States; (2) the legal and administrative decision making patterns used by federal agencies to fund academic research; and (3) the expression of demands on the academic research funding system, 1960–1965. K.W.

**N68-18409#** RAND Corp., Santa Monica, Calif.
**EFFECTS OF AN INCOME TAX ON LABOR SUPPLY**
Marvin Kosters Jan. 1968 34 p refs
(P-3757; AD-664042) CFSTI: HC $3.00/MF $0.65

The discussion of the effects of an income tax on labor supply and welfare is presented in the context of highly simplified models which abstract from problems such as shifts in the distribution of income and other complications introduced by progressivity. It is intended to point out the kinds of labor supply parameters on which changes in labor supply depend when alternative tax changes are considered, and to assemble some evidence on the welfare cost of an income tax. However, the evidence on compensated wage rate effects was obtained by studying only some readily measurable dimensions of labor supply for some components of the labor force. Although the effect on the allocation of time of a relative price distortion at the labor-leisure margin appears to be very small, except perhaps as it affects the labor force behavior of married women, an income tax can also affect consumption-savings decisions as well as the allocation of labor among different types of employment. Author (TAB)

**N68-18130*#** *Washington Univ., St. Louis, Mo. Dept. of* Economics.
**LONG TERM IMPACTS OF BIG TECHNOLOGY**
Murray L. Weidenbaum Feb. 1968 17 p refs Presented at the 6th Goddard Mem. Symp., Washington, D. C., 4 Mar. 1968 *Its* Working Paper 6801
(Grant NsG-342)
(NASA-CR-93355) CFSTI: HC $3.00/MF $0.65 CSCL 05C

It is pointed out that the close, continuing relationship between the Federal Government and its major suppliers of large technical systems is resulting in a convergence between the two, which is reducing much of the distinction between the public and private sectors. To a substantial degree, the government is taking on the traditional role of the private entrepreneur while the companies are becoming less like other corporations and more like government agencies or arsenals. The recommendation is made that government procurement policies need to be modified in order to halt the erosion of the basic entrepreneurial character of the firms that undertake large-scale developmental programs for government agencies. Second thoughts need to be given before the Nation agrees to the almost uncritical demands for extending the use of the government-oriented corporations to other parts of the public sector Author

**N68-18120*#** Washington Univ., St. Louis, Mo. Dept. of Economics.
**TOWARD A PEACETIME ECONOMY**
Murray L. Weidenbaum Feb. 1968 25 p refs Presented at the Dept. of Econ. Seminar Ser. on the Cost of Conflict, Kalamazoo, Mich., 28 Feb. 1968 *Its* Working Paper 6803
(Grant NsG-342)
(NASA-CR-93356) CFSTI: HC $3.00/MF $0.65 CSCL 05C

Public planning in a peacetime economy is considered to provide information for policy-makers concerned with the role of the national space program in a post-Viet Nam context. Earlier defense cutbacks are discussed, and mention is made of efforts aimed at alleviating existing problems that could be adapted and expanded to cover specific problems arising from disarmament. Consideration is given to shifting to peacetime production, converting defense industries, and the adaptability of American labor. Tax reduction, monetary and financial policy adjustments, rapid and long-run expansions in government programs, and federal aid to state and local governments are discussed; as are aid to veterans, defense workers, areas, and companies. Four major components suggested for an effective initial economic adjustment policy following peace in Viet Nam are tax reduction, a general ease in monetary policies, an increase in government transfer payments, and an acceleration in the rate of space and other existing programs. M.W.R.

**N68-17656#** RAND Corp., Santa Monica, Calif.
**RISK AND THE AEROSPACE RATE OF RETURN**
*Irving N. Fisher and George R. Hall* Dec. 1967 77 p refs
(Contract F44620-67-C-0045; Proj. RAND)
(RM-5440-PR; AD-663726)

The relationship between risk and profit is explored and a method for measuring the risk component of corporate earnings is developed. Average risk premiums and risk-adjusted rates of return are estimated for aerospace and 10 other industry groups. Risk is defined as the probability that earnings in some future period will differ from an anticipated value. Assuming that, on average, profit expectations are fulfilled, risk can be measured by characteristics of the earnings distribution. Standard deviation and skewness are the statistical variables used to measure the firms risk exposure. A statistically significant relationship is found between average rates of return on net worth and both standard deviation and skewness. Average risk adjusted rates of return are estimated for each industry group and compared with nominal rates of return. The risk-adjusted rates of return for drugs and aerospace are noticeably larger than those for the other industry groups. This finding implies that, for this sample, above-average rates of return in the aerospace group cannot be explained by above-average risk exposure. Author (TAB)

**N68-17161*#** New York Univ., N. Y. Graduate School of Public Administration.
**PLANNING FOR IMPACT: A CASE STUDY OF THE IMPACT OF THE SPACE PROGRAM ON HUNTSVILLE, ALABAMA**
Robert A. Myers Feb. 1967 419 p refs
(Grant NGR-33-016-067)
(NASA-CR-93066) CFSTI: HC $3.00/MF $0.65 CSCL 05C

An investigation is presented of the impact of the space program on Huntsville, Alabama. It is shown that impact repercussions can be understood and that urban planning studies can provide information sufficient to form a sound base for impact planning. Steps are indicated to show how planning can maximize impact benefits while reducing impact costs. It is found that the utilization of urban planning techniques is a means toward understanding the effects of impact. The distillation of impact response information through the planning process yields a long range guide for city development, and determines a short range strategy for the solution of impact problems. Other areas given detailed consideration are economic changes, population changes, and government responses. C.T.C.

**N68-15755*#** Missouri Univ., Columbia. Research Center.
**REGIONAL EQUITY AND THE GEOGRAPHIC DISTRIBUTION OF FEDERAL R&D FUNDS**
John M. Brazzel 8 Sep. 1967 36 p refs
(Grant NGR-26-004-012)
(NASA-CR-91656) CFSTI: HC $3.00/MF $0.65 CSCL 05C

Geographical patterns of federal research and development funds are discussed, and an analysis is presented of the relationships between state characteristics and the distribution of federal R and D funds as reported by the Daddario subcommittee. Various aspects of the problem of regional inequity in distribution of these funds are considered, including the spatial allocation of funds, the equitable treatment of regions, and regional effects of federal R and D funds. In 1965, 3 of 10 states received 37 and 65%, respectively, of federal R and D funds; and distribution was highly correlated with the scientific capabilities of the institutions. Rather than to reallocate the distribution of these funds, increasing the educational facilities and research capabilities are suggested. While an inequity in funds distribution is noted, it is also noted that R and D funds are a very small portion of the federal budget. M.W.R.

**N68-15482*#** Missouri Univ., Columbia. Research Center.
**FEDERAL R&D EXPENDITURES AND THE GEOGRAPHIC DISTRIBUTION OF R&D ACTIVITY**
John M. Brazzel and Gary K. Freerksen 19 Oct. 1967 12 p refs
(Grant NGR-26-004-012)
(NASA-CR-91657) CFSTI: HC $3.00/MF $0.65 CSCL 05C

Comparisons of state distributions of federal research and development funds and distributions of scientists engaged in R and D activities were made by using Gini coefficients to determine the extent of concentration or inequalities in these regional distributions. These coefficients indicate a fairly high degree of inequality in the distribution of scientists for the years 1962, 1964, and 1966; as well as an absence of any changes in the relative inequality of distribution during the 1962–1966 period. M.W.R.

**N68-12525*#** Missouri Univ., Columbia. Research Center.
**THE OWNERSHIP OF INDIVISIBLE INPUTS AND THE AGGLOMERATION OF RESOURCES**
Donald Murry 24 Nov. 1967 11 p refs
(Grant NGR-26-004-012)
(NASA-CR-91058) CFSTI: HC $3.00/MF $0.65 CSCL 05C

Authors normally associate the agglomeration of resources at single geographical locations with the presence of indivisibilities; in this analysis we attempt to go beyond that association in order to investigate two factors which appear to affect the tendency of resources to agglomerate spatially. These factors are the ownership of the indivisible input and the utility functions of the entrepreneurs of the firms utilizing the indivisible inputs. Author

# M9 GENERAL

**N68-87598 #** RAND Corp., Santa Monica, Calif.
**ANNOTATED BIBLIOGRAPHY ON SYSTEMS COST ANALYSIS**
P. A. DonVito Mar. 1967 85 p refs
(Contract F44620-67-C0045)
(RM-4848-1-PR) CFSTI: HC $3.00/MF $0.65

A bibliography is presented which includes books, pamphlets, articles, papers, and technical and research memoranda. A brief description is given of the nature and content of each work. Titles are grouped into the following categories: cost analysis for purposes of systems analysis, cost estimating in military planning, program budgeting, system definition, cost categories, cost elements, cost-estimating relationships and methodology, data requirements, individual systems analysis, total force structure and program analysis, models, and uncertainty and special problems. P.A.B.

**N68-86134#** Defense Dept., Washington, D. C. Office for Lab. Management.
**BIBLIOGRAPHY OF MANAGEMENT ANALYSIS REPORTS, NOTES AND MEMORANDA**
Claudette N. Guilford 15 Mar. 1968 10 p refs Supersedes MAM-67-2
(AD-667174; MAM-68-2; MAM-67-2) CFSTI: HC $3.00/MF $0.65

A bibliography is presented of forty studies and reports published from 1964 to March, 1968, on the in-house Department of Defense establishments that perform research, development, test, and evaluation, and on federal contract research centers. P.A.B.

**N68-32091*#** National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

**MANAGEMENT: A SELECTIVE BIBLIOGRAPHY**

14 Jun. 1968 142 p

(NASA-TM-X-61145; GP-532) CFSTI: HC $3.00/MF $0.65 CSCL 05B

A selective management bibliography is presented to give managers and students of management in the Kennedy Space Center community an overview and an awareness of Library resources in the management field. An author and subject index is included along with a list of periodicals wholly or partially devoted to management subjects. B.S.D.

**N68-19693*#** Delaware Univ., Newark.

**THE ADMINISTRATION OF RESEARCH. AN INTERPRETIVE SUMMARY OF THE PROCEEDINGS OF THE NATIONAL CONFERENCE ON THE ADMINISTRATION OF RESEARCH, 1947–1964**

Leslie B. Williams and Sidney E. Clark 1966 171 p

(Contract NSR-08-001-010)

(NASA-CR-93723) CFSTI: HC $3.00/MF $0.65 CSCL 05A

An attempt is made to examine, interpret, and summarize information in the field of research management and administration that has been presented as the past eighteen National Conferences on the Administration of Research. The subjects covered include the roles of the university, industry, government, and independent organizations in research, as well as their relationships to one another, the role of the research director, the management of research operations, the management of creativity, innovation, and motivation, and ethics in research administration and public affairs. R.N.A.

# IAA ENTRIES

## M1 PROGRAM MANAGEMENT

**A68-45051**
THE PLACE OF SYSTEMS AND PROCEDURES IN MANAGING AN ENGINEERING ORGANIZATION.
G. D. Christensen and R. W. Rau (McDonnell Douglas Corp., McDonnell Aircraft Co., St. Louis, Mo.).
Society of Automotive Engineers, Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 7-11, 1968, Paper 680684. 6 p.
Members, $0.75; nonmembers, $1.00.

Discussion of the role of a modern-day engineering systems and procedures (ES&P) group in a large engineering organization. Their well-earned recognition as experienced problem solvers permits meaningful participation in the development of management systems, graphic procedures, and profitable applications for automation and computer graphics systems. This practiced "principle of intimate familiarity" is in contrast with that of staffing with "experts by appointment." Certain key operational philosophies influence the contribution of this function and the broad scope of its operations furthers the practical implementation of engineering management philosophies. A brief discussion of the required level of people skills indicates that the term "management consultants" aptly fits the mold. P.v.T.

**A68-44997** #
PROGRAM MANAGEMENT OF A SMALL PROJECT IN A LARGE CORPORATION.
W. T. Barker (North American Rockwell Corp., Los Angeles, Calif.).
American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-1130. 11 p.
Members, $1.00; nonmembers, $1.50.

Development of some guidelines for handling a small contract in a large corporation from the program manager's standpoint. The subjects covered include allowable incentives, proper mix of project and specialized groups, "other commitments" of key personnel, special management techniques, real hours and dollars control, and avoiding grievances. Specific examples of small project techniques are provided. M.G.

**A68-44993** #
C/S/P-A - A MANAGEMENT CONTROL SYSTEM FOR COST/SCHEDULE/PERFORMANCE-ACHIEVEMENT ON SCIENTIFIC SATELLITE PROGRAMS.
Rafael Schapiro (TRW Systems Group, Systems Integration and Engineering Div., Redondo Beach, Calif.).
American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-1133. 13 p.
Members, $1.00; nonmembers, $1.50.

The paper describes a management control system specifically designed for use on small (approximately $1 million) R&D hardware programs. Although developed at TRW for use on scientific satellite programs, C/S/P-A (Cost/Schedule/Performance-Achievement) is equally applicable to other projects with similar contractual and management problems. The system scales down the fundamental concepts of the Air Force 375 System Program Management series and combines these with certain portions of the DOD/NASA PERT/Time, PERT/Cost, and Technical Performance Measurement modules, modified to meet the need of small program management requirements. Techniques were developed to help the program manager prepare accurate plans that are then converted into simple tools for continuous management control. C/S/P-A does not require computer support although it can easily be linked to a computer-based cost reporting system. After the initial startup effort, the C/S/P-A can be maintained in a few hours per week by administrative personnel. (Author)

**A68-43863**
THE ROLE OF TECHNOLOGICAL FORECASTING IN PLANNING FOR COMPANY GROWTH.
H. Q. North and D. L. Pyke (TRW, Inc., Redondo Beach, Calif.).
IN: ELECTRONIC MANAGEMENT, PUBLIC PROGRAMS AND EDUCATION; WESTERN ELECTRONIC SHOW AND CONVENTION, LOS ANGELES, CALIF., AUGUST 20-23, 1968, TECHNICAL PAPER VOLUME 12. PART 5. [A68-43862 23-34]
Convention sponsored by the Institute of Electrical and Electronics Engineers and the Western Electronic Manufacturers Association.
North Hollywood, Calif., Western Periodicals Co., 1968, p. B/1-1 to B/1-10. 8 refs.

Description of TRW's experience with technological forecasting one of several techniques which a company may use in improving its selectivity in the allocation of those resources committed toward insuring its future. A modification of the Delphi technique was used, which seeks to take full advantage of the committee approach, while at the same time eliminating some of the disadvantages. The Delphi technique deals individually with each member of the committee and protects his anonymity. The TRW experimental study, described, resulted in the publication of a document containing a forecast of 401 technical events which a panel of experts felt would occur during the next twenty years and which would have a significant impact on the products, services, or processes of the company. F.R.L.

**A68-39658**
THE EE's GUIDE TO PROJECT MANAGEMENT. V - GETTING THE MOST FROM PROJECT MANAGEMENT - AN OVERVIEW.
Marvin Flaks and Russell D. Archibald (Booz, Allen and Hamilton, Inc., New York, N.Y.).
Electronic Engineer, vol. 27, Aug. 1968, p. 33, 35, 36, 38.

Review of the fundamentals of project management in electrical engineering. The essence of project management is stated, and the management personnel is discussed along with the tools to assist efficient management. The concepts of planning, organizing, directing, and controlling have their place in practically all managerial tasks. Where the duties of even one person relate to more than one facet of an effort, a project plan improves the quality and timing of that effort. The more people or contractors are involved, the more important a formal plan becomes. The results obtained may be an effective selling point for project management. P.v.T.

**A68-38735** *
SYSTEMS ENGINEERING - IMPLEMENTATION.
Joseph F. Shea (NASA, Office of Manned Space Flight, Washington, D.C.).
IN: NEW METHODS OF THOUGHT AND PROCEDURE; SYMPOSIUM ON METHODOLOGIES, PASADENA, CALIF., MAY 22-24, 1967, PROCEEDINGS. [A68-38733 20-34]
Symposium sponsored by the California Institute of Technology and the Society for Morphological Research.
Edited by Fritz Zwicky and A. G. Wilson.
New York, Springer-Verlag New York, Inc., 1967, p. 85-96.

Discussion of the implementation phase of systems engineering. In this phase, systems engineering becomes interwoven with the primary management tasks. A review of the design approach must be undertaken, a test program must be established to assure that all elements meet the requirements specified, and system specifications must be maintained to pass on and control all recommended changes so that overall system integrity and compatibility are assured. Finally the ultimate use of the system must be planned and observed

to certify adequacy or spotlight areas where improvements in design or operational concept must be achieved. The problem of interfaces between different subjects is also discussed. R. M.

**A68-38734**
SYSTEMS ENGINEERING - PLANNING.
Dean Gillette (Bell Telephone Laboratories, Inc., Transmission Systems Engineering Div., Holmdel, N. J.).
IN: NEW METHODS OF THOUGHT AND PROCEDURE; SYMPOSIUM ON METHODOLOGIES, PASADENA, CALIF., MAY 22-24, 1967, PROCEEDINGS. [A68-38733 20-34]
Symposium sponsored by the California Institute of Technology and the Society for Morphological Research.
Edited by Fritz Zwicky and A. G. Wilson.
New York, Springer-Verlag New York, Inc., 1967, p. 73-84.

Description of systems engineering in terms of the actions in the output of various aspects of the work. Systems engineering is understood to provide information in the broad, nontechnical sense to aid management; it can facilitate decisions and help to establish new objectives. It also involves the evaluation of the performance of an operating equipment. Advantages and limitations of mathematical modeling are examined. Recommendations for the training of systems engineers are given. R. M.

**A68-38197**
SYSTEMS ANALYSIS AND POLICY PLANNING: APPLICATIONS IN DEFENSE.
Edited by E. S. Quade (RAND Corp., Mathematics Dept., Santa Monica, Calif.) and W. I. Boucher (RAND Corp., Santa Monica, Calif.).
New York, American Elsevier Publishing Co., Inc., 1968. 474 p. $11.50.

A survey is presented of the nature, aims, and limitations of systems analysis in current defense planning. Several methods of analysis are discussed, including a Monte Carlo computer routine (which simulates the operations and maintenance requirements of complex equipment at one or several locations), the analytic scenario, and the Delphi technique. The establishment of criteria for decision-making and the utility of accepted standards for measuring the effectiveness of alternatives are examined. The processes by which the principles of suboptimization are defined, and the problems of handling uncertainty are discussed. An introductory example of analysis and a discussion of the problem of selecting operationally useful objectives are presented. The character and importance of costs in systems analysis are described. Resource analysis and cost-sensitivity analysis are treated in depth. The nature of models - i.e., what they are, how they are constructed and used, their limitations, and their place in analysis as a whole - is discussed. Game theory, simulation, scenarios, war gaming, and political analysis are treated in connection with the nature of models. Flaws, in both analysis and analysts, that can seriously affect the conduct or evaluation of systems studies, are noted. M. G.

**A68-38054 ***
INTEGRATION AND UTILIZATION OF MANAGEMENT SCIENCE ACTIVITIES IN ORGANIZATIONS.
Michael Radnor, Albert H. Rubenstein, and Alden S. Bean (Northwestern University, Evanston, Ill.).
Operational Research Quarterly, vol. 19, June 1968, p. 117-141. 7 refs.
Grant No. NsG-495.

A large-scale field study was undertaken to attempt to improve our understanding of the experiences of operational research and related management science (OR/MS) activities in U. S. industries. Multiple interviews were conducted in 66 major firms. An initial analysis of the data suggests several parameters which might be important to the success of management science activities and which researchers may wish to consider in future efforts at theory building. Examples of such factors are: background of the OR/MS leaders and analysts; succession of leaders; amount of OR/MS exposure in the firm; extent of computer usage in the firm; organizational location; project missions; top management relations; client relations; staff relations; and personality conflicts. Selected cases are presented to illustrate the interaction of many of these factors in the reported experiences of several firms. Interface relations are examined with special attention given to data collection and implementation problems. The increasing usage of liaison roles is noted. Further studies are being conducted to compare these U. S. experiences with those of OR/MS activities in other countries. (Author)

**A68-37796** #
CONTRACTOR PROGRAM MANAGEMENT - FORECAST FOR 1975.
Clyde Cocke (Avco Corp., Wilmington, Mass.).
IN: CANAVERAL COUNCIL OF TECHNICAL SOCIETIES, SPACE CONGRESS, 5TH, COCOA BEACH, FLA., MARCH 11-14, 1968, PROCEEDINGS. VOLUME 3. [A68-37788 19-07]
Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1968, p. 20.4-1 to 20.4-19. 32 refs.

Description of contractor systems management techniques required in the 1968 time period, and forecast of probable changes that will exist in 1975. The techniques discussed are mandatory to satisfy newly instituted DOD policies on development and production of new weapon systems. The newly instituted management changes are introduced, and their impact on industry is discussed. The Contractor System Management Office and its functions are described. The contractor business cycle, and typical changes to it, as a typical program evolves, are discussed. Future trends in systems management are considered. F. R. L.

**A68-37780** #
INTEGRATED MANAGEMENT INFORMATION SYSTEM (IMIS).
G. H. Boos (General Electric Co., Cape Kennedy, Fla.).
IN: CANAVERAL COUNCIL OF TECHNICAL SOCIETIES, SPACE CONGRESS, 5TH, COCOA BEACH, FLA., MARCH 11-14, 1968, PROCEEDINGS. VOLUME 2. [A68-37762 19-31]
Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1968, p. 16.2-1 to 16.2-15.

Description of the integrated management information system (IMIS) which is designed to enable the Kennedy Space Center to accomplish its management task. IMIS operates with the three disciplines of configuration management, logistics, and reliability and quality assurance. Each discipline is treated as a separate and distinct entity and then integrated with the other two so that a change or modification in any one discipline is impacted on the other two disciplines, and the effect of the impact is known. Each discipline is discussed, together with the manner in which each of them is integrated with the other. M. M.

**A68-37611**
THE SPECIFICATION APPROACH TO SYSTEM ENGINEERING MANAGEMENT.
Donald H. Heaton (USAF, Systems Command, Andrews AFB, Washington, D. C.).
IN: ANNALS OF ASSURANCE SCIENCES; PROCEEDINGS OF THE SEVENTH RELIABILITY AND MAINTAINABILITY CONFERENCE, SAN FRANCISCO, CALIF., JULY 14-17, 1968. [A68-37596 19-15]
Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics.
New York, American Society of Mechanical Engineers, 1968, p. 230-233.

Discussion of a program initiated toward developing a system engineering management which involves both the government and private industry. The problem of achieving a government-industry relationship which is viable in today's and tomorrow's environment of interrelated military, technological, economic and management factors is discussed. System-engineering-management requirements documents which are to be used as guidance for the government and as contractual requirement for industry are outlined. A method which is an adaption of classic problem solving techniques to the system definition role is described. M. G.

**A68-37171**
LONG-RANGE TECHNICAL PLANNING.
Laurence D. McGlauchlin (Honeywell, Inc., Research Center, Hopkins, Minn.).
Harvard Business Review, vol. 46, July-Aug. 1968, p. 54-64.

Description of methods by which a large corporation whose divisions are wide apart in products as well as in geography, developed a coordinated procedure for research evaluation, as the basis for a five-year technical plan. In planning research, three principal sources of necessary output were used: (1) the divisional engineering and marketing groups that eventually make use of the research results; (2) the research scientists, who are in touch with new scientific trends; and (3) the top corporate financial, legal, and administrative staffs. The interaction between scientist, engineer, and marketing expert focuses attention on projects that could not only become scientifc successes, but successes in terms of sales and profits also. While the solution to the problem of long delay of feedback in research can never be found, the coordination of divisional and research effort appears to be the best solution. P.v.T.

**A68-37129**
EXECUTIVE CONTROLS.
Louis Fried (Bourns, Inc., Riverside; California, University, Berkeley, Calif.).
Management Services, vol. 5, May-June 1968, p. 17-26. 6 refs.

Outline of a system of executive controls suggested for the managements of companies too large for personal control and too small for employment of specialized staffs. It is pointed out that, for the medium-sized firm, control of overall performance is feasible within the necessary parameters of expense if it is done through the application of recommended techniques as a part of an overall control system. The control system must include all the necessary components (such as planning and comparison of standards with actual performance), and must be clearly defined to avoid time wasted as a result of ambiguous instructions. M.M.

**A68-37126**
ORGANIZATION AS A TOTAL SYSTEM.
Stanley Young (Massachusetts, University, Systems Research Group, Amherst, Mass.).
California Management Review, vol. 10, Spring 1968, p. 21-32.

Discussion of a system engineering approach for the design of a business organization, conducive to the full utilization of new managerial technologies. On a normative basis, organizations should be viewed as a total system, if the organization output is to be increased. At this time, however, only the basic characteristics of total systems can be blocked out, due to the initial stages of this development. There has been an attempt to demonstrate that the systems approach is a highly conducive vehicle for the incorporation of current managerial technologies, unlike the bureaucratic structure which represents a serious constraint. The essential role of the manager is that of a designer of organizational or behavioral systems, just as the engineer is the designer of machine systems. The design of a large complex system, however, will necessitate a team effort, and specialists will be required to integrate the team effort.
P.v.T.

**A68-34704**
MANAGING COSTS FOR PROFIT. II - IMPLEMENTING STRATEGIC PLANS, OPERATIONAL PLANNING AND CONTROL.
P. A. Norman (Rolls-Royce, Ltd., Small Engines Div., Leavesden, Herts., England).
Aeronautical Journal, vol. 72, June 1968, p. 498-508. 7 refs.

Description of procedures of managing costs for profit by implementing management control as well as control at operational levels. The implementation stage is one where considerable scope exists for ensuring future effectiveness through sound direction, in that the plan becomes a firm commitment at this stage. An overall picture of the necessary and basic disciplines in strategic planning, management control, and operational control, if effective management of costs for profit is to be achieved, is provided. A brief summary and a list of recommendations for future activities within the Management Studies Group of the Society, aimed at definition of a basis for application of the described disciplines, are given. M.M.

**A68-33978** #
THE MANAGEMENT OF LARGE EUROPEAN INTERNATIONAL PROGRAMMES.
A. H. C. Greenwood (British Aircraft Corp. /Operating/, Ltd., London, England).
Canadian Aeronautics and Space Institute and American Institute of Aeronautics and Astronautics, Management in the Fields of Aerospace Meeting, Montreal, Canada, July 8, 9, 1968, AIAA Paper 68-802. 10 p.
Members, $1.00; nonmembers, $1.50.

A review of the Concorde civil supersonic transport and the Jaguar Military Strike/Trainer Anglo/French programs is presented. The governmental and industrial administrative organizations are reviewed, and an assessment is made of the political, economic, and industrial factors relating to the initiation and fulfillment of these joint ventures. The advantages and disadvantages of such forms of international collaboration are studied, and the future pattern of European international program management is considered. The paper concludes with an opinion of the future impact of European aviation industrial collaboration upon the military and civil aircraft markets throughout the world. (Author)

**A68-31414** #
SYSTEMS ANALYSIS IN MANAGEMENT.
Del Burchfield (U.S. Army, PMR Div., Washington, D.C.).
IN: AMERICAN SOCIETY FOR QUALITY CONTROL, ANNUAL TECHNICAL CONFERENCE, 22ND, PHILADELPHIA, PA., MAY 6-8, 1968, TRANSACTIONS. [A68-31412 15-15]
Milwaukee, American Society for Quality Control, Inc., 1968, p. 87-94.

Study of systems analysis and apportionment of resources. Three main factors - time, cost, and performance - are considered. The objectives in the use of resources (manpower, time, assets, and dollars) should be to reach an optimum so that (1) improved technical performance can be obtained only by an increase in time or cost factors, and (2) poorer technical performance would result if time factors or costs decreased. F.R.L.

**A68-30344**
THE EE'S GUIDE TO PROJECT MANAGEMENT. II - THE PROJEC MANAGER - WHO HE IS AND HOW HE GOES ABOUT ORGANIZING A PROJECT.
Marvin Flaks (Booz, Allen and Hamilton, Inc., Project Management and Control Div., Chicago, Ill.) and Russell D. Archibald (Booz, Allen and Hamilton, Inc., Chicago, Ill.).
Electronic Engineer, vol. 27, May 1968, p. 20, 23, 24, 27-32.

Examination of the functions and responsibilities of the project manager with an inquiry into the nature of the best project managers. Various types of project manager are described, and his authority and his impact on his organization are treated. Various aspects of the project manager's function are discussed - including functional division of projects, keeping control of the project, interface management, determining the project breakdown structure (PBS), and managing resources. R.A.F.

**A68-30343**
THE EE'S GUIDE TO PROJECT MANAGEMENT. I - THE CONCEPTS BEHIND THE MODERN "SYSTEMS" APPROACH TO CONTROLLING COMPLEX OPERATIONS AND PROGRAMS.
Marvin Flaks (Booz, Allen and Hamilton, Inc., Project Management and Control Div., Chicago, Ill.) and Russell D. Archibald (Booz, Allen and Hamilton, Inc., Chicago, Ill.).
Electronic Engineer, vol. 27, Apr. 1968, p. 28, 30, 31, 33, 34.

Discussion of the concepts behind the project-management approach, which is becoming increasingly important in electronics. Projects are defined as unique, well-defined efforts to produce certain specified results at a particular point in time. Project management is an evolving skill or discipline of great importance to all areas of business, industry, and government. Five distinct phases: conception, definition, design, development, and utilization make up projects, and these phases are discussed in detail. F.R.L.

**A68-29244 ***
INDUSTRIAL PROJECT MANAGEMENT.
George A. Steiner (California, University, Graduate School of Business Administration, Los Angeles, Calif.) and William G. Ryan (Indiana University, School of Business, Bloomington, Ind.).
Research supported by NASA, Grants No. NsG-237-62(S-2); No. NsG-05-007-003; No. NGR-05-007-090.
Toronto, Collier-Macmillan Canada, Ltd., 1968. 255 p.
$6.95.

The results of a study of managerial practices and problems of industrial project managers in the aerospace industry are discussed in this text. A model of managerial methods drawn from a series of interviews is given, and methods of managing and completing complex projects with superior technical results and substantial savings in cost and time are delineated. The role of government control and the degree to which the success of a project is contingent on the amount of authority delegated to the project manager are emphasized. The trend to increased direction and control of the industrial project manager by government is considered, as well as the problems resulting from the reduction of the project manager's authority. Three appendices provide actual government regulations concerning the aerospace industry. B.B.

**A68-23836**
SYSTEM/COST EFFECTIVENESS - THE END OF THE FIRST ERA.
Jerome Klion (USAF, Systems Command, Research and Technology Div., Rome Air Development Center, System Effectiveness and Support Section, Griffiss AFB, N.Y.).
IN: UTILIZATION OF RELIABILITY; ANNUAL WEST COAST RELIABILITY SYMPOSIUM, 9TH, CENTURY CITY, CALIF., FEBRUARY 16, 1968, PAPERS. [A68-23834 10-15]
Symposium sponsored by the Los Angeles Section of the American Society for Quality Control.
North Hollywood, Calif., Western Periodicals Co., 1968, p. 21-40. 11 refs.

Discussion of the technical, cost-analysis, and management tools necessary for application of system/cost effectiveness to modern day Air Force systems. Progress, to date, pertinent to the development of the tools is reviewed. It has been found that system effectiveness analyses are not only feasible, but practical as well; that sufficient know-how exists to design for system effectiveness; that demonstration and validation techniques for system effectiveness are under development; that steps are being taken to improve the cost-effectiveness technology so that it can be utilized as a more precise tool; and that documentation for system/cost effectiveness implementation has been initiated. P.v.T.

**A68-23595**
SYSTEMS ENGINEERING METHODS.
Harold Chestnut (General Electric Co., Research and Development Center, Information Science Laboratory, Schenectady, N.Y.).
New York, John Wiley and Sons, Inc., 1967. 402 p.
$11.95.

A text is presented which is directed toward the development of a broad systems engineering approach to help trained people improve their decision-making capability. The systems approach is also considered to have validity for areas in which the emphasis may be social, economic, or political. An attempt is made to introduce sequentially the various functions and evaluations that are required before a system can be engineered. The need for recognizing all the steps to be performed in realizing an operating system and for organizing systematic ways to perform them are pointed up. The importance of formulating and structuring a system, and the various methods by which it can be achieved are described. Several methods of establishing the value of a system are presented, followed by a discussion of the classical bases for arriving at system cost, cost-benefit, and cost-sensitivity considerations. Attention is given to control of system time by scheduling, PERT, CPM, and task network scheduling. Reliability from system concept to system operation is treated. The major systems engineering methods and tools are described. F.R.L.

**A68-22912 ***
AMBIGUOUS AUTHORITY DEFINITION IN PROJECT MANAGEMENT.
Richard Alan Goodman (California, University, Los Angeles, Calif.).
Academy of Management Journal, vol. 10, Dec. 1967, p. 395-407.
Grants No. NsG-342; No. NsG-26-008-003.

Discussion of the dual authority problem created by the implementation of the project management technique in R&D organization. The basic findings demonstrated that the use of an ambiguous authority definition was the most common adaptation to such a problem. Comments are made on the benefits and drawbacks of such adaptations. (Author)

**A68-16410**
PROJECT MANAGEMENT - A SCIENCE, AN ART, OR AN ORGANIZATION PROBLEM? I.
R. E. W. Harland (Ministry of Technology, London, England).
Royal Aeronautical Society, Journal, vol. 71, Dec. 1967, p. 821-824.

Discussion of project management problems from the viewpoint of the British Ministry of Technology. The aim of this management is to check whether the required performance can be achieved in the correct time scale and within the agreed cost, and to ensure that nothing is entirely unexpected. The various stages of a project, starting with the assessment of the feasibility of each aspect of the project, and leading to a specification in the form of a firm requirement, and finally to the contract, are examined, with particular reference to time scale and cost. The aspects of the most usual types of contract ("cost plus," "fixed profit," "fixed price," and "shared incentive") are reviewed. The manner in which projects are organized in the Ministry of Technology is illustrated by a graph. V.P.

**A68-15543**
AN ENGINEERING APPROACH TO SOFTWARE CONFIGURATION MANAGEMENT.
B. L. Ryle (Planning Research Corp., Los Angeles, Calif.).
(INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, 1966 AUTOMATIC SUPPORT SYSTEMS SYMPOSIUM FOR ADVANCED MAINTAINABILITY, CLAYTON, MO., NOVEMBER 7-9, 1966, PROCEEDINGS, p. 6A-1 to 6A-5.)
IEEE Transactions on Aerospace and Electronic Systems, vol. AES-3, Nov. 1967, p. 947-951.

Discussion of some practical problems which have arisen in past systems development efforts, including the development of software. Some of the practical benefits of adopting configuration management are considered, along with associated implications. The necessity of treating Automatic Support Equipment (ASE) software development as an engineering task is emphasized. It is concluded that the development of ASE software must be planned, organized, managed, and controlled as any other element of the system, to prevent the software from continuing to lag behind the hardware and from plaguing the schedule. S.Z.

**A68-11803 ***
EXPERIENCE AS A FACTOR IN THE SELECTION AND PERFORMANCE OF PROJECT MANAGERS.

Irwin M. Rubin and Wyckham Seelig (Massachusetts Institute of Technology, Alfred P. Sloan School of Management, Cambridge, Mass.).
IEEE Transactions on Engineering Management, vol. EM-14, Sept. 1967, p. 131-135. 9 refs.
Grant No. NsG-235.

Examination of the relationship between a project manager's background characteristics and certain characteristics of the projects he is asked to manage and of the impact of this decision process by relating project manager experience and project characteristics to measures of project performance. The findings indicate that organizations select their oldest and most experienced project managers to direct large, high-priority projects. Performance is then superior without relation to the project manager's total experience, but in relation to the high priority given larger projects. With the exception of a measure of "growth in responsibility," none of the measures of the project manager's experience were found to bear any direct relationship to project performance. (Author)

# M2 CONTRACT MANAGEMENT

**A68-44998** #
NEW DIMENSIONS IN AEROSPACE SUBCONTRACT MANAGEMENT
J. B. Butler and R. Ginsberg (General Electric Co., Aerospace Group, Missile and Space Div., Philadelphia, Pa.).
American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-1132. 9 p.
Members, $1.00; nonmembers, $1.50.

Description of approaches developed to alleviate specific aerospace subcontracting problem areas covering basic management control, reporting techniques, and materials, parts, and process controls. Lower-tier subcontractor controls, customer, contractor, and subcontractor relationship, subcontractor motivation, and management of nonaerospace suppliers are also examined. Typical of the subject matter discussed are work package management for development subcontracts; use of phased procurement to control schedule and costs; when to team and how to define commitment limitations; subcontractor motivation ranging from public to customer recognition programs to financial rewards for successful flight performance; and establishment of optimum interfaces and control of scientific experiment developers. M.G.

**A68-38056**
COMPETITIVE BIDDING - DECIDING THE BEST COMBINATION OF NON-PRICE FEATURES.
Kenneth Simmonds (Manchester Business School, Manchester, England).
Operational Research Quarterly, vol. 19, Mar. 1968, p. 5-14. 7 refs.

A procedure is outlined for deciding the mix of price and variable nonprice features, such as quality, delivery, service or financing, to be included in a bid. The level of each nonprice feature is set independently by comparing incremental spending against the alternative price reduction and basing the choice on value to the faction in the customer organization expected to dominate in the choice of the successful bid. Divergence from competition on all nonprice features, both fixed and variable, is then taken into account in setting price by calculating a net price equivalent of feature differences as against each competitor. For any given markup the probability of success against a competitor over whom there is a net advantage is the same as that for an equivalently lower markup were price to be the sole basis for allocating the order. (Author)

**A68-37613**
MANAGEMENT OF SYSTEMS EFFECTIVENESS ASPECTS OF SATURN V CONTRACTING AND PROCUREMENT.
Frank L. Hale and W. Bruce Dalrymple (Boeing Co., Aero-Space Div., Launch Systems Branch, Huntsville, Ala.).
IN: ANNALS OF ASSURANCE SCIENCES; PROCEEDINGS OF THE SEVENTH RELIABILITY AND MAINTAINABILITY CONFERENCE, SAN FRANCISCO, CALIF., JULY 14-17, 1968. [A68-37596 19-15]
Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics.
New York, American Society of Mechanical Engineers, 1968, p. 250-255. 7 refs.

Description of the techniques for Apollo/Saturn V management of the systems effectiveness aspects of the contracting and the procurement of components critical to the Saturn V mission. One of the salient systems effectiveness parameters of the Saturn V launch vehicle is the overall reliability level which must equal or exceed 0.85. The Saturn V management plan and a typical Saturn V contractor's program are described. F.R.L.

**A68-37133**
HOW TO GET QUALITY RESULTS FROM SUBCONTRACTORS.
Noble A. Langille (PRD Electronics, Inc., Product Reliability Intertype Co., Westbury, N.Y.).
Management Review, vol. 57, Apr. 1968, p. 34-41.

Discussion of a systematic set of procedures that help in selecting the most reliable subcontractors and vendors. The procedure also constitutes a way of ensuring that those selected comply with performance, reliability, and maintenance standards and delivery and cost schedules. The procedures apply in situations where the subcontracting involves production work and not advanced engineering or development. They fall into the following six phases: (1) preliminary drawings and specifications; (2) preliminary subcontractor review; (3) basis of subcontractor selection; (4) subcontractor evaluation requirements prior to manufacture; (5) qualification and acceptance test; and (6) subcontractor and vendor surveillance during production. M.M.

**A68-37130**
ANALYSIS OF COMPETITIVE BIDS.
W. N. Smith and J. R. McCreight (Dow Chemical Co., Freeport, Tex.).
Management Services, vol. 5, May-June 1968, p. 40-44.

Description of a computerized routine for balancing material against purchasing costs for the analysis of competitive bids. With this computer routine, the purchasing agent can compare changes in material costs with changes in purchasing costs as the number of vendors is varied and find the optimum cost combination. M.M.

# M3 RESEARCH & DEVELOPMENT

**A68-42918**
THE ROLE OF THE INFORMAL ORGANIZATION IN DECISION MAKING ON RESEARCH AND DEVELOPMENT.
David W. Conrath (Pennsylvania, University, Dept. of Industry, Philadelphia, Pa.).
(Institute of Management Sciences, Annual International Meeting, 13th, Philadelphia, Pa., Sept. 6-8, 1966.)
IEEE Transactions on Engineering Management, vol. EM-15, Sept. 1968, p. 109-119. 30 refs.

Study of the informal organizations of researchers as a means of obtaining insights into the administration of such personnel so as to lead to improvements in the formal organization. An informal organization is defined as one that arises without conscious planning initially to meet personal and/or organizational needs that are not met within the framework of the formally recognized structure. One tentative conclusion indicates a net value in the practice of rotating scientific personnel in and out of administrative positions, appointments being temporary for a fixed duration rather than permanent. F.R.L.

**A68-38081**
CREATING AN ENVIRONMENT FOR CREATIVITY.
A. H. Eschenfelder (International Business Machines Corp., Research Laboratory, San Jose, Calif.).
Research Management, vol. 11, July 1968, p. 231-240. 7 refs.

Reflections on the requirements for creative thinking. Considering the creative process as a synthesis of various elements, environmental conditions needed for creativity are described, some typical environmental problems are discussed, and certain recommendations on how to foster creative thinking are given. R.M.

**A68-38057**
CREDIBILITY FORECASTS AND THEIR APPLICATION TO THE ECONOMIC ASSESSMENT OF NOVEL RESEARCH AND DEVELOPMENT PROJECTS.
D. H. Allen (Nottingham University, Nottingham, England).
Operational Research Quarterly, vol. 19, Mar. 1968, p. 25-42. 17 refs.
Research supported by the Science Research Council.

Discussion of the reasons why probabilistic methods are considered inappropriate when forecasting for novel research and development (R&D) projects and description of an alternative technique using credibility forecasts. Credibility forecasts for stages of a project are transformed into pairs of standardized "focus" forecasts from which are obtained two focus cash flow curves for the complete project. Two derived focus values of any suitable economic criterion are compared with a neutral value of the criterion to evaluate the attractiveness of the project and the degree of risk involved. The use of this technique for the initial assessment of a project and for reassessment at later stages is discussed and the procedure is illustrated by an example. P.v.T.

**A68-38003**
THE MYTHS OF RESEARCH MANAGEMENT.
Edward B. Roberts (Massachusetts Institute of Technology, Sloan School, Cambridge, Mass.; Pugh-Roberts Associates).
Science and Technology, Aug. 1968, p. 40-46.

Discussion of the necessity for a factual basis in research and development (R&D) management, challenging the mythology existing in the areas of decision making, information storage and retrieval, and government contracting. New directions in which alternatives to present practice may be found are suggested. The author also advocates that more resources be devoted to "research on research," pointing out that for all the billions spent each year on R&D, very little support goes toward the study of the total process. P.v.T.

**A68-37125**
THE JOB OF THE MODERN RESEARCH MANAGER.
W. E. Bradley (Union Oil Company of California, Los Angeles, Calif.).
Research Management, vol. 11, May 1968, p. 167-175. 8 refs.

Discussion of the requirements for efficient management and the measurement of management success (or failure). From all the intelligence a manager has gained, by skillful communication, about the present and probable future environment of the business, he must formulate the goals toward which he must commit himself and his resources. In other words, he has identified the "right things" to do, or rather to get done. In his analysis, he will have established some priority among "right things," both in timing and in the degree of commitment weighed against the value of achievable results. The job elements of a manager are: (1) communication, (2) analysis, (3) commitment, (4) planning, and (5) achievement. P.v.T.

**A68-37123**
A CASE STUDY - RESEARCH & DEVELOPMENT PLANNING IN AN AEROSPACE COMPANY.
William E. Dirkes (Systems Research Laboratories, Inc., Physics Div., Dayton, Ohio) and Don R. Ostrander (Bell Aerospace Corp., Bell Aerosystems Co., Buffalo, N.Y.).
Research Management, vol. 11, Mar. 1968, p. 119-138.

Discussion of research and development planning on the basis of the experience and work relations of a number of companies in the aerospace industry. The following major planning steps are recommended: (1) study of the projected economic and technological environment which relates to corporate objectives; (2) definition of the key targets, which lead to the major objectives established; (3) development of comprehensive road maps which illustrate the interdependence of major milestones or projects and supporting technological development; and (4) preparation of conceptual designs of systems to meet key opportunities. In addition, there remains the requirement to establish priorities for immediate goals, plans of action, and specific resources plans. For a successful operation of the plan, clarity in the goals, and clear detailing of the problems to overcome are of importance. P.v.T.

**A68-34229**
USING TECHNICAL FORECASTS.
Marvin J. Cetron (U.S. Naval Material Command, Exploratory Development Div., Washington, D.C.).
Science and Technology, July 1968, p. 57-63.

Study of the potential of technological forecasting as an aid in planning R&D budgets. The benefits arise when these projections are incorporated as part of the planning process. This is done on two levels: when deciding on future work in a specific development project, and when assigning priorities to the overall R&D effort. Systems being developed in the Navy and other branches of the federal government are able to integrate technological forecasts with data on future needs, probabilities of success, and potential funding levels. The computerized result is a complete ranking of all ongoing and potential projects according to their overall worth. F.R.L.

**A68-33977** #
THE MANAGEMENT OF A LARGE NEW AIRCRAFT PROGRAM.
Malcolm T. Stamper (Boeing Co., Everett Branch, Seattle, Wash.).
Canadian Aeronautics and Space Institute and American Institute of Aeronautics and Astronautics, Management in the Fields of Aerospace Meeting, Montreal, Canada, July 8, 9, 1968, AIAA Paper 68-801. 10 p.
Members, $1.00; nonmembers, $1.50.

Examination of the four phases of the task facing management in the Boeing 747 life cycle. These phases are market-product planning, precommitment planning, program implementation, and product evolution. The challenge to management which the design and construction of the aircraft poses is discussed in terms of the magnitude of the task, the general philosophy developed to implement the program, and the effectiveness of the effort up to the present time. R.B.S.

# M4 MANAGEMENT TOOLS & TECHNIQUES

**A68-45050**
WHEN BUDGET VARIANCES WARRANT INVESTIGATION BY ENGINEERING PROJECT MANAGEMENT.

G. J. Schick (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Santa Monica; Southern California, University, Los Angeles, Calif.) and J. L. Maybell (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Santa Monica, Calif.).
Society of Automotive Engineers, Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 7-11, 1968, Paper 680683. 11 p.
Members, $0.75; nonmembers, $1.00.

The paper discusses two quantitative decision tools: one based on actual variance and one based on probability of observing such a variance. Both are used in deciding when to explore budget variances. The two methods are: calculation of decision areas based on the cost of investigation and expected savings produced by an investigation; and calculation of the variance as a function of both time remaining in schedule and budget remaining. Both methods can be programed on a computer, and details of the application of either method are presented. (Author)

**A68-44818**
PROGRAMMING FOR GOVERNMENTAL OPERATIONS - THE CRITICAL PATH APPROACH.
Anthony James Catanese (Georgia Institute of Technology, Graduate Program in Planning, Atlanta, Ga.) and Alan Walter Steiss (Virginia Polytechnic Institute, Center for Urban and Regional Studies, Blacksburg, Va.).
Public Administration Review, vol. 28, Mar.-Apr. 1968, p. 148-154. 10 refs.

Criticism of the argument that programing and analysis techniques developed by private enterprise are not applicable to governmental activities. Two techniques which offer the most potential for governmental operations, but at the same time are relatively simple in their application, are the critical path method and heuristic programing. These techniques are presented first in general terms and then as they have been applied to a fairly complex, nonproduct-oriented governmental activity - the third phase of the Wisconsin State Planning Program. P. v. T.

**A68-44817**
PROGRAM AND RESPONSIBILITY COST ACCOUNTING.
Francis E. McGilvery (Management Assistance Corp., Washington, D.C.).
Public Administration Review, vol. 28, Mar.-Apr. 1968, p. 148-154. 10 refs.

Discussion of cost accounting as a primary financial information base for planning, programing, and budgeting (PPB) systems. Cost data must be gathered at operating levels in terms of work that is done and events which occur at those levels in order to be useful to responsible operating managers. Then cost data must be manipulated, in accordance with established accounting principles and techniques, to present it in forms appropriate to PPB's particular kind of analysis and evaluation. Departments and agencies must adhere to established cost-accounting doctrine, the principles of the Comptroller General, and statutory requirements, and through those means meet the data requirements of PPB. Otherwise PPB, from a cost-accounting standpoint, can result in the creation of systems which are in conflict with controlling accounting doctrine and requirements. P. v. T.

**A68-40801**
THE ORIGIN AND HISTORY OF PROGRAM BUDGETING.
David Novick (RAND Corp., Cost Analysis Dept., Santa Monica, Calif.).
California Management Review, vol. 11, Fall 1968, p. 7-12. 13 refs.

General outline of basic elements, historical roots, and present program budgeting in the Federal government. The Controlled Materials Plan during World War II is described as the first programed Federal budget. Weapons system analyses are considered, and it is emphasized that economic, social or political aspects constitute quantitative changes which distinguish program budgeting from industrial systems analyses. R.M.

**A68-37793** #
SPACE AGE MANAGEMENT - WHERE TOMORROW?
C. E. Wray (U.S. Navy, Naval Ship Missile Systems Engineering Station, Port Hueneme, Calif.).
IN: CANAVERAL COUNCIL OF TECHNICAL SOCIETIES, SPACE CONGRESS, 5TH, COCOA BEACH, FLA., MARCH 11-14, 1968, PROCEEDINGS. VOLUME 3. [A68-37788 19-07]
Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1968, p. 20.1-1 to 20.1-6. 5 refs.

Examination of the role played by electronic data processing (EDP) in management. It is considered that management can be supported by information systems but not performed by them, that the EDP system can materially assist in the process of control and decision making by summarizing and analyzing raw data in the former and providing feedback information in the latter, that the system must be coupled with high-caliber middle managers who know the system and departmental functions thoroughly, and that managerial preoccupation with information systems deters effective management. F.R.L.

**A68-37779** #
IMPROVED TECHNIQUES FOR THE MANAGEMENT OF LAUNCH OPERATIONS.
Joseph M. Verlander (Martin Marietta Corp., Aerospace Group, Cocoa Beach, Fla.).
IN: CANAVERAL COUNCIL OF TECHNICAL SOCIETIES, SPACE CONGRESS, 5TH, COCOA BEACH, FLA., MARCH 11-14, 1968, PROCEEDINGS. VOLUME 2. [A68-37762 19-31]
Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1968, p. 16.1-1 to 16.1-15. 7 refs.

Discussion of improved automatic-computer techniques applied to the management of launch operations and the development of an automated management-reporting system. Some of the advantages and disadvantages in comparison with manual reporting systems are cited. The original schemes were developed and evaluated during the checkout and launch of the Gemini launch vehicle. The system can be applied to any major integration task involving numerous interfaces and different hardware configurations. M.M

**A68-37132**
THE INFORMATION SYSTEM AUDIT - A CONTROL TECHNIQUE FOR MANAGERS.
Benjamin Conway.
Management Review, vol. 57, Mar. 1968, p. 37-48.

Recommendation of a continuing audit for the information systems of large companies, especially those that are widely spread geographically, in order to assure close management control and efficient research and development (R&D). This audit should be conducted by personnel other than those directly concerned with R&D, forming a fairly small audit team. The objectives of the audit should be fully defined at each of the four major stages of development: the planning, development, implementation, and post-installation phases. Close contact must be maintained with the users of the system, so that the audit-team members can fully understand their needs and requirements. The audit team must also concern itself with two major kinds of risks: the risk that the system or parts of it will not work, and the risk that the amount of resources committed to this particular system may leave other systems' work vulnerable. P.v.T.

**A68-37131**
STATISTICAL DECISION THEORY.
Benny R. Copeland (North Texas State University, Denton, Tex.).
Management Services, vol. 5, May-June 1968, p. 45-51. 11 refs.

Discussion of the essence of statistical decision theory, and indication of its application by means of an illustrative example. It is pointed out that this new approach to problem solving can lead to better decisions if properly applied. However, the technique can only complement, not replace, the executive's own knowledge and experience.
M.M.

**A68-37128**
CLARIFYING RESPONSIBILITY RELATIONSHIPS.
T. M. Hamilton (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Santa Monica, Calif.).
California Management Review, vol. 10, Spring 1968, p. 41-52.

Discussion of the management responsability matrix (MRM) designed to forestall difficulties and misunderstandings arising over responsibility. To serve this purpose, MRM has been introduced as an important supplement to the more conventional techniques such as organization charts, position guides, and detailed procedures The primary objective of the MRM is to increase the effectiveness of organizational performance by providing the visibility and control necessary to cope with complex working relationships. This is accomplished through its threefold usefulness: (1) as a means of analyzing the total organization and managerial process; (2) as a focal point to objectively clarify and resolve problems relating to organizational responsibilities and authorities; and (3) as a guideline for the administration of the overall organizational effort.
P.v.T.

**A68-36563**
THE APPLICATION OF OPTIMAL CONTROL THEORY TO COST EFFECTIVENESS.
R. O. Kidd (TRW Systems Group, Redondo Beach, Calif.).
IN: AMERICAN AUTOMATIC CONTROL COUNCIL, JOINT AUTOMATIC CONTROL CONFERENCE, 9TH, UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH., JUNE 26-28, 1968, PROCEEDINGS. [A68-36496 18-10]
New York, Institute of Electrical and Electronics Engineers, Inc., 1968, p. 855-862.
Grant No. AF AFOSR 669-67.

Presentation of a new cost effectiveness technique based on optimal control theory. This technique utilizes the control theory formulation of the Lagrange problem of the calculus of variations. The technique is dynamic in the sense that it optimizes the design parameters and support policies of a military system or commercia product as functions of total program cost. Present techniques are static in the sense that they maximize effectiveness for a fixed cost or minimize cost for a fixed effectiveness level. The dynamic technique provides the executive or customer with considerably more information upon which to base major design decisions, and it readily permits tradeoffs between cost and effectiveness to be considered in the decision-making process. The formulation is quite general so that the technique can be applied to both military systems and commercial products in the concept formulation, preliminary design, and development phases of a hardware program. The paper presents several simple illustrations of the formulation and describes an efficient method of numerical solution.
(Author)

**A68-36328**
THE EE'S GUIDE TO PROJECT MANAGEMENT. IV - THE COMPUTER'S ROLE IN NETWORK MANAGEMENT SYSTEMS.
Marvin Flaks and Russell D. Archibald (Booz, Allen and Hamilton, Inc., New York, N. Y.).
Electronic Engineer, vol. 27, July 1968, p. 33, 34, 36-40, 42.

*Introduction to the adaptation of network planning and monitoring* systems to computer processing. The advantages and disadvantages of computer use are discussed in general, and various factors relevant to the decision of whether to computerize a network (e.g., network size and complexity, processing sophistication, updating periods, the timeliness required of reporting, the air of authenticity and authority attached to computer printouts) are treated. The adaptation of a network to computer analysis - including the breakdown of a network into subnetworks - is discussed. Means of getting accuracy in computer reports and implementing total time/cost manpower analysis systems are considered. A specific system applying the principles discussed is outlined.
R. A. F.

**A68-33979** #
THE MANAGEMENT OF A MODERN AEROSPACE RESEARCH PROGRAM.
D. A. Hicks (Northrop Corp., Northrop Corporate Laboratories, Hawthorne, Calif.).
Canadian Aeronautics and Space Institute and American Institute of Aeronautics and Astronautics, Management in the Fields of Aerospace Meeting, Montreal, Canada, July 8, 9, 1968, AIAA Paper 68-803. 5 p.
Members, $1.00; nonmembers, $1.50.

Discussion of some of the factors responsible for the upgrading of a modern aerospace research program, with emphasis on the importance of communication between the planning group and the various elements of the research organization. Technical journals and scientific seminars are briefly considered as the chief means of this communication. The difficulty of reconciling creative independent research with strict planning and control is considered.
R.B.S.

**A68-33389**
THE EE's GUIDE TO PROJECT MANAGEMENT. III - NETWORK SYSTEMS - A PROJECT MANAGEMENT TOOL.
Marvin Flaks and Russell D. Archibald (Booz, Allen and Hamilton, Inc., Chicago, Ill.).
Electronic Engineer, vol. 27, June 1968, p. 27-32, 34.

Description of PERT (Program Evaluation and Review Technique) charts, their construction and some problems encountered in their use. The PERT system goes through several phases. The first is the network plan, which shows in graphic form what must be accomplished to complete the project. The chart portrays two elements: activities and events. Activities represent time-consuming actions. Events represent points in time, and exact dates which usually mark the planned start of completion of activities. The keynote to a successful network chart is advance planning. The preferable way to construct a PERT chart is to work from back to front although it can be constructed in both directions following the chart back and forth until the network is refined to the n-th degree. Tradeoff-evaluations procedures based on cost considerations are discussed.
M.G.

**A68-30883**
EXPERIENCES WITH AN R & D PROJECT CONTROL MODEL.
William E. Souder (Monsanto Co., Organic Chemicals Div., Organic Research Dept., St. Louis, Mo.).
IEEE Transactions on Engineering Management, vol. EM-15, Mar. 1968, p. 39-49. 13 refs.

Traditional R&D project cost control systems relate only expenditures with elapsed time, rather than expenditures and achievement with time. Achievement reporting is generally considered separately from cost reporting. A theoretical control model relating cost and achievement with time for R&D projects is developed and described. This model is shown to provide early warnings of impending project failures, a more conceptual pinpointing of the forces affecting these impending failures, and a detailed analysis of the achievement per dollar spent. Controlling by dollars spent per time period is shown to potentially yield erroneous conclusions. These results are based on an application of the model to chemical development projects and from an application of the model to a representative sample of chemical research projects. The relationships of these results to the overall development of an integrated planning and control system are shown.
(Author)

**A68-30882**
MODELING PRODUCTION OPERATIONS.
William K. Roots (Aston, University, Birmingham, England) and Israel Wilenitz.
IEEE Transactions on Engineering Management, vol. EM-15, Mar. 1968, p. 30-39. 14 refs.

The systems analysis approach has been applied to individual production operations in small technology-based manufacturing corporations. This is, in effect, corporate microsystem analysis which differs conceptually from the corporate macrosystems analysis approach popular in current literature. Network models have been derived for such production microsystems, and their dynamics have been examined for the common practice of exerting production control through delayed discontinuous feedback or feedforward. (Author)

**A68-30881**
PARALLEL AND SEQUENTIAL R & D STRATEGIES - APPLICATION OF A SIMPLE MODEL.
William J. Abernathy (California, University, Graduate School of Business Administration, Los Angeles, Calif.) and Richard S. Rosenbloom (Harvard University, Graduate School of Business Administration, Boston, Mass.).
(American Association for the Advancement of Science, Annual Meeting, Symposium on Quantitative Studies in R & D Management, Washington, D.C., Dec. 29, 1966.)
IEEE Transactions on Engineering Management, vol. EM-15, Mar. 1968, p. 2-10. 16 refs.
NSF Grant No. GP-2723; Contract No. Nonr-1866(54).

Description of a simple analytical framework which may help managers to make better decisions about the use of parallel strategies of investigation and development. The principal focus is based on studies of 14 projects and illustrates the application, in one setting, of a general model appropriate to the structure of the decision as it is widely faced in practice. The information requirements for a sound choice between parallel and sequential strategies are discussed, together with the consequences of choosing a strategy on the basis of incomplete information. M.F.J.

**A68-24703**
THE PRINCIPLES AND OBJECTIVES OF COST-EFFECTIVENESS ANALYSIS.
A. Stratton (College of Aeronautics, Dept. of Mathematics, Cranfield, Beds., England).
(Royal Aeronautical Society, Rotorcraft Section, Lecture, Jan. 18, 1967.)
Aeronautical Journal, vol. 72, Jan. 1968, p. 43-52; Discussion, J. R. Ewans, T. H. Kerr, T. K. Szlenkier, and J. A. J. Bennett, p. 52, 53.

Outline of the principles, method of operation, and objectives of cost and effectiveness analysis, based on published information and the author's experience of application in the defence field. The techniques are of application to other fields of major expenditure such as transport, building and power generation. The process of decision-making and cost control, based on the conventional method of requirement specification and that based on cost and effectiveness analysis are compared. The basic elements of the analysis process are outlined. The problems of apportioning costs to the operational roles are illustrated by examples based on 1966-1967 defence estimates. The method of conducting cost and effectiveness studies is described, particular attention being paid to the implications for the design engineer. Observations are made on the education and training of cost-effectiveness analysis. (Author)

**A68-18423**
COST EFFECTIVENESS, SYSTEM EFFECTIVENESS, INTEGRATED LOGISTIC SUPPORT, AND MAINTAINABILITY.
Ben S. Blanchard (General Dynamics Corp., Electronics Div., Maintainability Section, Rochester, N.Y.).
(IEEE Transactions of Aerospace and Electronic Systems, vol. AES-3, Mar. 1967, p. 186-194.)
IEEE Transactions on Reliability, vol. R-16, Dec. 1967, p. 117-126. 17 refs.

Outline of the basic elements associated with cost effectiveness, system effectiveness, and integrated logistics support. The interrelationships of these concepts are reviewed, and the discipline of maintainability - a major element of each concept - is examined. Maintainability is defined as an effective mechanism for the accomplishment of planned maintenance during the early design and development phases of a system. M.F.

**A68-15242**
SIMULATION OF A MANUFACTURING SYSTEM.
Julian Reitman (United Aircraft Corp., Norden Div., Norwalk, Conn.).
Simulation, vol. 8, June 1967, p. 311-317.

Description of a computer-simulation technique for predicting the manufacturing characteristics of custom integrated circuits. The performance of a manufacturing facility was compared in terms of its ability to fabricate small quantities of a wide variety of integrated circuits in a reasonable time and at costs comparable to those of large-scale production. The computer-simulation technique was used as a convenient way to compare the major factors in manufacturing integrated circuits, both standard and custom. The way these factors exist for one set of requirements can be modeled. Then the model and the factors can be restructured to accommodate a new set of rules for a different production system. Once the model of the facility has been built, it can be used to compare a variety of policies, facilities, and capabilities. Since there are no analytical ways to accomplish this, a discrete-event computer simulation model was developed. The simulation language selected was the general-purpose systems simulator III (GPSS). M.M.

**A68-13544**
PROJECT COST ESTIMATING.
R. L. Petruschell (RAND Corp., Santa Monica, Calif.).
(Royal Aeronautical Society, Meeting, Bristol, England, June 22, 1967, Paper.)
Royal Aeronautical Society, Journal, vol. 71, Nov. 1967, p. 737-744.

Discussion of analytical methods for project cost estimating in military planning of weapon and support systems. Analysis for long-range planning is considered as the initial filtering of a wide range of ill defined alternatives in order to identify those which should become the subjects of more detailed analyses. Cost-effectiveness analysis, cost-utility analysis, cost-benefit analysis, and systems analysis provide methods for making comparisons considering both cost and effectiveness. A specific example of a cost-sensitivity analysis is described in detail for a defense system against submarine-launched ballistic missiles using manned aircraft armed with antimissile missiles. T.M.

# M5 PERSONNEL MANAGEMENT

**A68-42920**
TECHNICAL CAREER PROGRAMS IN LARGE RESEARCH AND DEVELOPMENT LABORATORIES.

J. Robert Garcia (Sandia Corp., Personnel Dept., Albuquerque, N. Mex.) and William L. Stevens (Sandia Corp., Advanced Systems Research Dept. and Technical Dept., Albuquerque, N. Mex.).
IEEE Transactions on Engineering Management, vol. EM-15, Sept. 1968, p. 129-138. 20 refs.
AEC-supported research.

Survey of nonsupervisory technical career programs for scientists and engineers in a group of 61 large research and development laboratories. A large fraction of these laboratories maintain technical career programs of varying forms and degrees of formality. Equivalent salary treatment in management and technical career structures is revealed in most cases. Suggestions for improving and strengthening these programs are given. V. Z.

**A68-37794** #
HUMANPOWER - A LOOK AT OUR GREATEST NATURAL RESOURCE.
Lydia I. Pickup (Boeing Co., Huntsville, Ala.).
IN: CANAVERAL COUNCIL OF TECHNICAL SOCIETIES, SPACE CONGRESS, 5TH, COCOA BEACH, FLA., MARCH 11-14, 1968, PROCEEDINGS. VOLUME 3. [A68-37788 19-07]
Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1968, p. 20.2-1 to 20.2-8.

A look at current trends shows that in 1966 there were more engineering job openings than applicants. Predictions are that the gap is going to widen appreciably through 1976. To attain the engineering goals set, the gap between demand and supply must be eliminated. The demand for engineers can be decreased by cutting back the goals or by proper utilization of engineers and engineering technicians. The supply of engineers can be increased by lowering standards or by adequately training all qualified youngsters. The only logical choice is to fully utilize those who are already trained and to train those who are capable. (Author)

# M6 URBAN MANAGEMENT

**A68-10812** *#
FORECASTING THE ECONOMIC IMPACT OF FUTURE SPACE STATION OPERATIONS.
R. A. Summers, S. M. Smolensky (NASA, Washington, D.C.), and A. H. Muir (Planning Research Corp., Washington, D.C.).
American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 4th, Anaheim, Calif., Oct. 23-27, 1967, Paper 67-962. 16 p. 22 refs.
Members, $1.00; nonmembers, $1.50.

The need for reliable estimates of economic and related earth-oriented benefits to be realized from earth-orbital operations is discussed, and recent work in this area is reviewed. Emphasis is given to those services based on remote sensing. Requirements for a uniform, comprehensive and flexible methodology are discussed. A brief review of the suggested methodology is presented. This methodology will be exercised through five case studies which were chosen from almost 400 user candidates. The relationship of case study results to benefits in broader application areas is discussed. Some management implications of possible future program implementation are included. (Author)

# M7 MANAGEMENT POLICY & PHILOSOPHY

**A68-44995** #
SPACE - A MULTIDISCIPLINARY CHALLENGE.
W. H. Kuhlman, Jr. (McDonnell Douglas Corp., McDonnell Astronautics Co., Huntington Beach, Calif.).
American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-1107. 16 p. 38 refs.
Members, $1.00; nonmembers, $1.50.

Discussion of the need for an ordered and integrated development of space technology, missions, and systems relative to their impact, beneficial or malevolent, upon society. This impact occurs in the technical, social, economic, political, and physical interaction arenas of societal development. The changes induced by the nature of typical space programs within each of these arenas are discussed, and they exemplify the potentially broad sphere of influence of operational space systems intended for the benefit of mankind. With the aid of an example, the systems analysis approach is shown to provide the means to formulate functional applications of space that can fulfill the needs of the U.S. in a beneficial manner. P.v.T.

**A68-37781** #
MIND ORGANIZATION - KEY TO EFFICIENCY IN SPACE AGE MANAGEMENT.
William F. Chana (General Dynamics Corp., Convair Div., Proposal Development Group, San Diego, Calif.).
IN: CANAVERAL COUNCIL OF TECHNICAL SOCIETIES, SPACE CONGRESS, 5TH, COCOA BEACH, FLA., MARCH 11-14, 1968, PROCEEDINGS. VOLUME 2. [A68-37762 19-31]
Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1968, p. 16.3-1 to 16.3-7. 9 refs.

Description of MIND organization, a concept of using a specific minimum number of functional departments. MIND organization uses common functions and disciplines to encourage communication, promote harmony, and strengthen the bond between a corporation's headquarters, its divisions, plants, test sites, large program offices, small project offices, and its customers' own program/project offices. It is a concept that can be adopted by a company as organization policy. Cost incentive contracting, total package procurement, and program/project management emphasize the need for early consideration of all systems criteria. The manager must have equal appreciation for business management, technology management, logistics management, and production management and the disciplines that fall within each of these functions. This early recognition and appreciation is a prerequisite to delivering quality-performance systems on schedule within budget. M.M.

**A68-36163**
THE INNOVATION OF INNOVATION.
Jack A. Morton (Bell Telephone Laboratories, Inc., Murray Hill, N.J.).
IEEE Transactions on Engineering Management, vol. EM-15, June 1968, p. 57-63; Discussion, p. 63-65.

The functions or roles of management in our inevitably changing environment are discussed. The evolution of management's role is traced, from that of a programer of an inanimate, already existing system to that of a system engineer concerned with the process of innovation. This process is the perception, creation, and transformation of relevant science into new and improved products and services. It is suggested that a new view may be appropriate - that of a manager as the selective agent of change - using as an analogy the ecological management of innovation, in which the manager's role is to increase the probability that the adaptive response of the system will succeed. (Author)

**A68-17062**
THE MANAGEMENT OF A MODERN INTEGRATED MISSILE RANGE.

G. D. Clark (Radio Corporation of America, Patrick AFB, Fla.).
(American Astronautical Society, Symposium on Future Space Programs and Impact on Range Network Development, New Mexico State University, Las Cruces, N. Mex., Mar. 22-24, 1967, Paper 67-59.)
IN: FUTURE SPACE PROGRAM AND IMPACT ON RANGE AND NETWORK DEVELOPMENT; AMERICAN ASTRONAUTICAL SOCIETY, SYMPOSIUM, NEW MEXICO STATE UNIVERSITY, LAS CRUCES, N. MEX., MARCH 22-24, 1967, PROCEEDINGS. [A68-17037 05-30]
Edited by G. W. Morgenthaler.
Tarzana, Calif., American Astronautical Society (AAS Science and Technology Series. Volume 15), 1967, p. 513-526.

Assessment of the management and cost factors involved in the operation of a modern integrated missile range, particularly under a contractor support environment. A brief description of the operation of a missile range is given as background to the analysis of these factors. The costs are divided into the initial costs of procuring and installing range instrumentation systems and the costs of the follow-on operation and maintenance. Four factors influencing efficient management are discussed. These factors are quality, timeliness, reliability, and responsiveness. The question of cost measurement is then analyzed in terms of cost accounting, budgets for each supervisor, and the profit and loss statement. The question of target-performance estimation and goal evaluation is examined. The performance categories that should be measured include data acquisition, scrubs, holds, maintenance, punctuality, computer reruns, and customer complaints. The total aspect of management thus consists of using: (1) accounting techniques; (2) performance parameters; and (3) an efficient information system. T.M.

# M8 ECONOMICS

**A68-39140** *#
AEROSPACE TECHNOLOGY AND THE FEDERAL BUDGET.
Murray L. Weidenbaum (Washington University, St. Louis, Mo.).
American Institute of Aeronautics and Astronautics, Impact of Aerospace Science and Technology on Law and Government Conference, Washington, D.C., Aug. 28-30, 1968, Paper 68-915. 8 p. 9 refs.
Members, $1.00; nonmembers, $1.50.
Grant No. NsG-342.

Demonstration of the likely availability of Federal funds to finance further expansions in aerospace science and technology during the period following the end of the Vietnam war. New methodologies for allocating public resources among aerospace and other program areas are described and analyzed. It is pointed out that the extent to which aerospace science and technology programs receive substantial shares of Federal discretionary revenues will reflect their ability to compete for funds against other public and private users. M.M.

**A68-33981** #
THE PROCESS OF ADAPTATION AND ITS IMPLICATIONS FOR MANAGEMENT.
Arthur Porter (Toronto, University, Dept. of Industrial Engineering, Toronto, Canada).
Canadian Aeronautics and Space Institute and American Institute of Aeronautics and Astronautics, Management in the Fields of Aerospace Meeting, Montreal, Canada, July 8, 9, 1968, AIAA Paper 68-807. 8 p.
Members, $1.00; nonmembers, $1.50.

The paper treats the evolution of management systems from the point of view of basic control system philosophy. Management systems constitute sets of complex interfaces between subsystems in which interaction is carried out through dialogue which is central to the adaptive process. An elementary model of adaptive behavior is outlined with particular reference to the processes of pattern generation and "probing the interfaces." It is stressed that the environment for management must necessarily be a "learning environment" - which explains the importance of the adaptive process. Of particular importance is the role of the computer and information networks in modern management - the computer is usually a central component in the model of an adaptive system. Finally, it is stressed that the characteristic of adaptation, which is fundamental in the management process, is also fundamental in the highly complex biological process of "managing the human body." (Author)

**A68-31039**
MANAGING COSTS FOR PROFIT. I - BUSINESS OBJECTIVES AND STRATEGIC PLANNING.
P. A. Norman (Rolls-Royce, Ltd., Small Engines Div., Leavesden, Herts., England).
Aeronautical Journal, vol. 72, May 1968, p. 423-430. 7 refs.

Introduction to the principles of analysis, planning, and control of costs in the aerospace industry. Such concepts as business objectives, management functions, cost-data requirements, and the relationship between management functions and accounting are discussed in general. Some proven techniques for cost planning and management for profitable operation are reviewed, with emphasis on the collection and evaluation of external and internal data and on the definition and updating of company objectives. R.A.F.

**A68-10622** *
IMPACT OF THE SPACE PROGRAM ON A LOCAL ECONOMY.
W. H. Miernyk, J. H. Chapman, Jr., Kenneth Shellhammer (West Virginia, University, Regional Research Institute, Morgantown, W.Va.), and E. R. Bonner (Pittsburgh, University, Dept. of Economics, Pittsburgh, Pa.).
Research supported by NASA, Grant No. NsG-474.
Morgantown, W.Va., West Virginia University Library, 1967. 167 p.
$6.00.

An input-output analysis of the impact on a local community (Boulder, Colo.) of the space program is presented. Boulder was selected because it has fairly well-defined boundaries, and is a local community. Major attention is devoted to the household or consumer side of the local economy. One hypothesis tested (and supported in the opinion of the authors), was that earlier small-area input-output studies had overstated the induced effects on local production and income resulting from exogenous changes in final demand. The major innovation is the development of a new type of income multiplier which, it is believed, has resulted in more accurate estimates of induced changes in the economy than earlier studies have produced. The study shows that a community such as Boulder is interdependent, although the major impacts resulting from exogenous changes in final demand clearly come by way of the household sector. F.R.L.

# M9 GENERAL

**A68-44819** *
GOVERNMENT, SCIENCE, AND TECHNOLOGY - A BIBLIOGRAPHICAL ESSAY.

Jack G. Cairl (NASA, Manned Spacecraft Center, Houston, Tex.) and Patrick R. Gallagher, Jr. (National Security Agency, Fort George G. Meade, Md.).

Public Administration Review, vol. 28, July-Aug. 1968, p. 373-381. 10 refs.

Discussion of the major issues and problems of science and government, and of the management of science and technology. Most arguments concerning science and government revolve around four central issues: (1) the advisability of establishing a strong national organization to direct all science programs in the U.S., (2) the extent to which scientists should participate in national policy making and in politics, (3) the proper relationship between the federal government and the universities, and (4) the balance between scientific freedom and security. A bibliographical review of various opinions concerning these arguments is given. P. v. T.

**A68-44449**

GOVERNMENT, INDUSTRY, AND THE RESEARCH PARTNERSHIP - *THE CASE OF PATENT POLICY.*

W. Henry Lambright (Syracuse University, Syracuse, N. Y.).

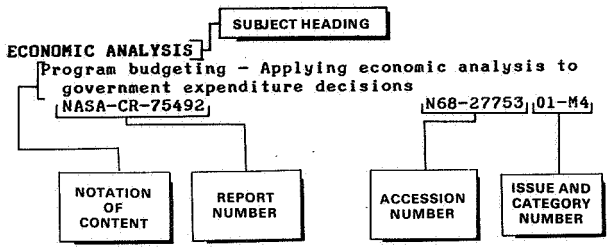
Public Administration Review, vol. 28, May-June 1968, p. 214-221. 16 refs.

*Discussion of the patent policy of the U.S. Government as it* affects ownership issues in government-industry partnerships. Government agencies and departments have a variety of approaches to the control of the technology developed through the partnership, and there are therefore a variety of consequences in terms of property rights and commercial value. The diversity in patent policy is principally due to the unique internal dynamics and history of the semiautonomous administrative subsystems involved in the partnership. P. v. T.

# Subject Index



## Typical Subject Index Listing

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## C

**COMMUNICATION**

Boeing 747 aircraft program management, discussing market product planning, precommitment planning, program implementation and product evolution
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A68-36163 03-M7

Research manager, discussing business orientation, commitment to communications and to entrepreneurial concepts A68-37125 03-M3

Morale factors hindering creativity and innovation in government research laboratories
NASA-CR-91664 N68-15494 03-M7

Process of professional information exchange among science information specialists and identification of information requirements
R/C-67-7 N68-81076 03-M5

Transfer of technical information in industrial R and D organizations
PB-175959 N68-82665 03-M3

Use and impact of verbal communication processes in psychological counseling involved in development of management employees in business
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**CONFIGURATION MANAGEMENT**

Software configuration management by engineering Methods, considering application to Automatic Support Equipment /ASE/ for Saturn S-4B stage A68-15543 03-M1

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Adaptation process of management systems from point of view of control system philosophy
AIAA PAPER 68-807 A68-33981 03-M8

Contractor systems management technique requirements and forecast for 1975
A68-37796 03-M1

Defense industry participation and effectiveness in functional engineering program
AD-665679 N68-20958 03-M4

Industrial project management practices and problems
NASA-CR-83193 N68-88319 03-M1

**CONTRACT NEGOTIATION**

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NASA-CR-65916 N68-14624 03-M2

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Cost accounting as financial information base for planning, programming and budgeting systems
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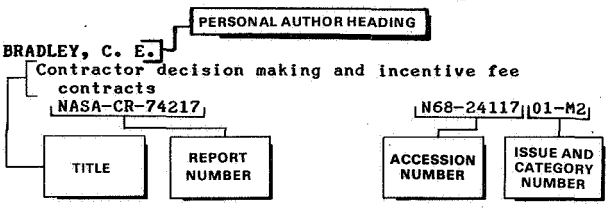
# Personal Author Index



## Typical Personal Author Index Listing

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# Corporate Source Index



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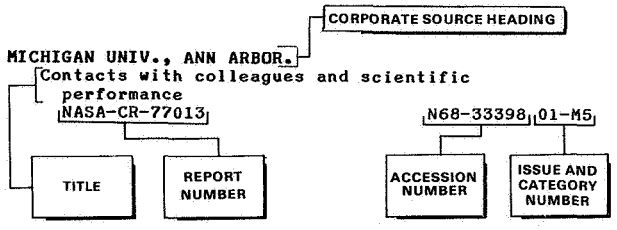


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Management and the systems analysis mystique
AD-669751 N68-87207 03-M1

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*Systems analysis in state government*
NASA-CR-93166 N68-82781 03-M6
Systems analysis in government administration - A critical analysis
NASA-CR-93167 N68-82782 03-M6
The political economy of efficiency - Cost-benefit analysis, systems analysis, and program budgeting
NASA-CR-77103 N68-88159 03-M4

CALIFORNIA UNIV., LOS ANGELES.
Small groups and the prediction of behavior
NASA-CR-90247 N68-11019 03-M5
An identification and analysis of organizational barriers to innovation
NASA-CR-91664 N68-15494 03-M7
An analysis of contractual incentives
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The pre-solicitation phase on government R and D contracting
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Industrial project management
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COLLEGE OF AERONAUTICS, CRANFIELD /ENGLAND/.
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Criteria for support service cost comparisons
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A model for establishing an obsolescence indication for practicing electrical engineers
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## D

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Bibliography of management analysis reports, notes and memoranda
AD-667174 N68-86134 03-M9

DELAWARE UNIV., NEWARK.
The administration of research. An interpretive summary of the Proceedings of the National Conference on the Administration of Research, 1947-1964
NASA-CR-93723 N68-19693 03-M9

## E

EUROPEAN SPACE TECHNOLOGY CENTER, NOORDWIJK /NETHERLANDS/.
Project management - A proposal to increase the effectiveness of project groups
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System management - Optimization of a satellite project
ESRO-TM-132/ESTEC/ N68-36920 03-M1

## G

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A functional basis for planning advanced technologies
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